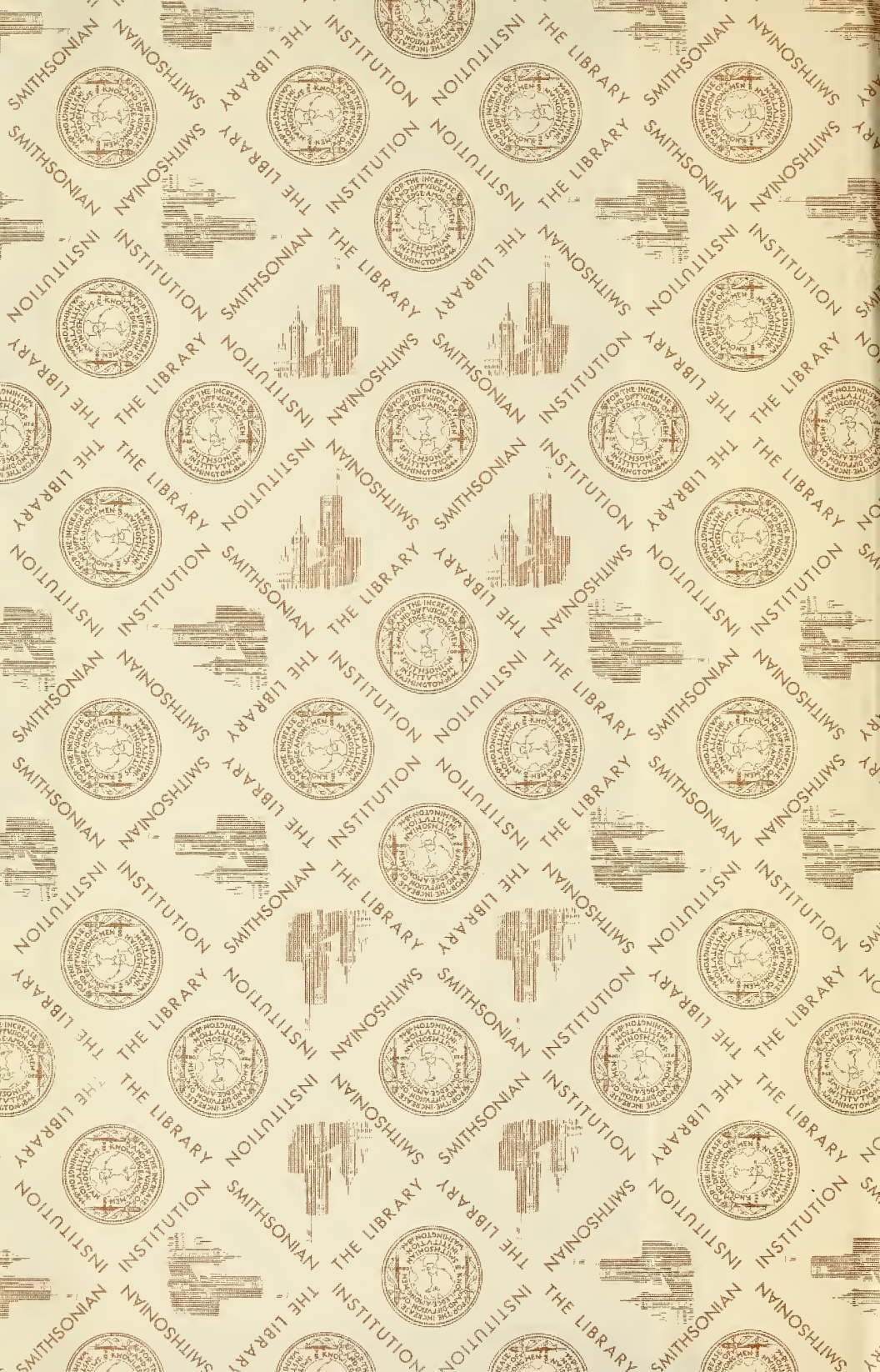
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PSYCHE

VOL. XLI MARCH 1934 No. 1

A NEW EURYTHRIPS (THYSANOPTERA) FROM TRINIDAD

By J. Douglas Hood

University of Rochester, Rochester, N. Y.

Through the kindness of Dr. C. P. Alexander, it has been possible to study a paratype of *Eurythrips ampliventralis* Hinds from the collection of the Massachusetts State College. This has resulted in the differentiation of the new species described below.

Eurythrips amplus sp. nov.

Female (macropterous).—Length about 1.5 mm. (distended, 1.9 mm.) Color brown, darkest in vertex and along sides of head and pterothorax and in distal portion of abdomen, paler in abdominal segments I-IV, in proximal angles of V-VII, in proximal fourth and distal two-fifths of tube, and in legs (particularly at ends of tibiæ and in tarsi, these being yellow); antennæ dark brown, with base of segment I, apex and middle portion of II, and pedicel of III nearly or quite yellow, IV-VII darkest basally, III paler apically; wings of fore pair pale brownish and darker at base; ocellar pigmentation red.

Head (Pl. 1, fig. 3) fully 1.42 times as long as greatest width, which is at proximal third of cheeks, the latter nearly evenly but decidedly rounded to eyes and very slightly converging in basal third, with a somewhat wider and indistinct basal collar, serrate as seen from above because of

short anastomosing lines which do not extend onto dorsum of head excepting faintly at extreme base[1], and with a slight tooth behind eyes; head sharply constricted at posterior margin of eyes, at this point narrowest and about 0.8 the least subbasal width, the width across eyes nearly equal to greatest width; vertex slightly elevated, subconical, distinctly produced and overhanging, bearing the anterior ocellus at its extremity, distinctly subreticulate, and with two pairs of small setæ, one of them behind the posterior ocelli, the other on sides of vertex and very slightly in advance of front margin of posterior ocelli; cheeks with about four pairs of similar small setæ in addition to a pair behind and between postocular setæ; postoculars nearly clear, expanded at tip, 83u long and 90u apart. *Eyes* strongly protruding, composed of relatively few large convex facets, about 0.3 as long as head, their width greater than 0.9 their interval and about three-fourths their length. *Ocelli* present, the posterior ones about 17u in diameter and about 0.6 as wide as their interval, the *median ocellus with posterior margin far* (12*u*) *in advance of anterior margin of eyes.* Antennæ (Pl. 1, fig. 4) about 2.16 times as long as head, *segments VI-VIII rather compactly united because of the very short and broad pedicels of VII and VIII, which are retracted into the apices of the preceding segments, VII with pedicel about* 15*u wide and very nearly twice as broad as that of VI, VIII with pedicel* 13*u wide;* sense-cones slender, the number on inner (and outer) surface of segments as follows: III 1(2), IV 1(2), V 1(1+1), VI 1(1+1), VII with the usual one on dorsum near apex; setæ long, slender, pale and pointed. *Mouth-cone* broadly rounded at tip, supasssing middle of prosternum.

Prothorax (Pl. 1, fig. 3) along median line of pronotum about two-thirds as long as head and (inclusive of coxæ) about twice as wide as long, with a short vestigial median thickening, with a few faint lines of sculpture along posterior margin, and fused with posterior half of epimera; anterior marginal setæ minute, the others nearly colorless,

[1]In order to show these at all in the figure, it has been necessary to represent them more conspicuously than they show in the specimen.

long, and dilated at tip, the anterior laterals 80u, midlaterals 78u, epimerals 79u, posterior marginals 87u, coxals 50u. Pterothorax distinctly wider than prothorax, notal plates nearly smooth. *Legs* normal; fore tarsus with a slight downwardly-directed tooth or claw at inner distal angle of first segment. *Wings* normal, the fore pair (Pl. 1, fig. 2) without accessory setæ and with the three subbasal setæ long, knobbed, pale, and comparable with those on anterior angles of pronotum.

Abdomen about 1.4 times as wide as prothorax across coxæ, free of sculpture save for the usual dark transverse line near bases of terga II-IX, major setæ mostly knobbed, the lateral pair on VII about 113u and pointed, its homologue on VIII about 97u and knobbed, that on IX about 123u and nearly pointed; tube (Pl. 1, fig. 1) about two-thirds as long as head and *only* 1.57 *times as long as greatest subbasal width,* this twice the apical width, sides very slightly concave in distal five-sixths, its terminal setæ pale and nearly 0.9 its length.

Measurements of holotype (♀): Length about 1.51 mm. (distended, 1.89 mm.); head, length 0.205 mm., greatest width (at basal fourth) 0.144 mm., width across eyes 0.139 mm., width at posterior margin of eyes 0.111 mm., least subbasal width 0.140 mm.; eyes, length 0.060 mm., width 0.045 mm., interval 0.048 mm.; prothorax, median length of pronotum 0.137 mm., width (inclusive of coxæ) 0.277 mm.; pterothorax, greatest width 0.331 mm.; abdomen, greatest width (at segment IV) 0.388 mm.; tube, length 0.132 mm., width near base 0.084 mm., at apex 0.041 mm.

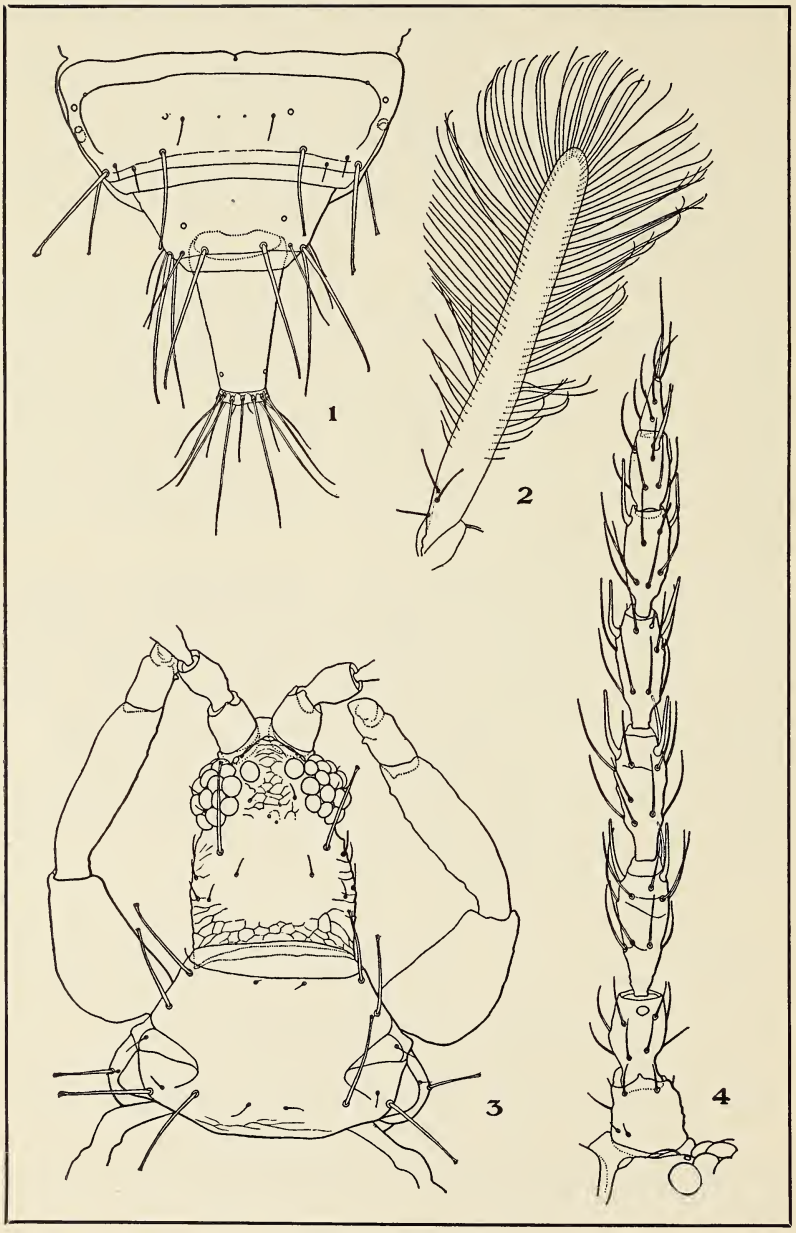
Antennal segments:	1	2	3	4	5	6	7	8
Length (u):	50	53	70	66	60	59	49	37
Width (u):	42	32	30	29	27	26	22	13

Total length of antenna 0.444 mm.

Described from one female taken by Dr. C. B. Williams at St. Joseph, Trinidad, March 4, 1918, by sweeping grass.

It is in some ways difficult to compare this with the closely allied *E. ampliventralis* Hinds, because one is known only in the macropterous form, the other only in the

Psyche, 1934 Vol. 41, Plate I



Hood—Eurythrips

brachypterous. One important difference, not correlated with wing development, is the peculiar structure of the pedicels of the last two antennal segments. In *amplus* these are very short, widened basally, and that of the penultimate segment is nearly twice as wide as that of the sixth. Other differences lie in the much larger size of *amplus,* in the longer and proportionately slenderer antennal segments, and in the much stouter tube. In *ampliventralis* this last is about 143 microns long and 79 microns wide near base, and the proportion of length to breadth is thus 1.81, as against 1.57 in *amplus.*

EXPLANATION OF PLATE 1.

(Drawn by Miss Helen E. Rearwin; camera lucida.)

Eurythrips amplus sp. nov.

Fig. 1.—Abdominal segments VIII-X, ♀, holotype.

Fig. 2.—Right fore wing, ♀, holotype.

Fig. 3.—Head and prothorax, ♀, holotype; all setæ omitted from appendages.

Fig. 4.—Right antenna, ♀, holotype.

NEW FORMS OF APHÆNOGASTER TREATÆ FOREL FROM THE SOUTHERN UNITED STATES (HYM.: FORMICIDÆ)

By George C. and Esther W. Wheeler
University of North Dakota

In describing new forms of *Aphænogaster treatæ* Forel, we have found the original specific description (1886) too brief. It seems desirable, therefore, to give here a few additional characteristics which we have found useful in comparisons.

Worker. Length of head exclusive of mandibles 1½ times its greatest width. Scape 1⅕ times the length of the head; lobe ¼ to ⅓ the length of the scape. The long flange bordering the lobe posteriorly[1] is low and the anterior surface of the lobe is convex except that the distal portion has a small concavity between the posterior and anterior flanges. The short anterior flange arising at an acute angle from the posterior one disappears into the anterior convexity. (See Fig. 1a and b.) The base of the epinotum is twice the declivity.

Head coarsely and longitudinally rugoso-reticulate with surface between the reticulations finely punctate. Frontal area with a median longitudinal ridge. Transverse striations on the dorsal surface of the epinotum commence at the base and merge into reticulations or indistinct striations in the region between the spines. Posterior surfaces of nodes densely and irregularly punctate. Mandibles hairy.

Thorax dark ferrugineous; head and abdomen above fusco-ferrugineous.

We have been unable to procure a female of *A. treatæ*.

[1]In this paper the anterior part of the lobe is that surface which faces forward when the scape is appressed to its groove in the head; the posterior, the area concealed thus.

MALE. Epinotum ⅓ the entire thorax, slightly longer than mesonotum. Spines usually reduced to blunt protuberances.[2] Base 3 times the declivity.

Head densely punctate. Mesoscutum smooth and irregularly pitted laterally, finely punctate above, coarser behind; scutellum punctate, mesopleuræ smooth, striated near anterior border. Anterior half of base of epinotum smooth, posterior half of its base punctate; its declivity irregularly cross-striated. Nodes faintly punctate, postpetiole with a narrow band of lateral longitudinal striations.

Abdomen shining and smooth except the posterior halves of petiole and postpetiole, which are rugosely and finely reticulate. A few hairs on the head, almost none on the thorax; scattered longer hairs on the abdomen.

Dark fuscous; legs and tip of abdomen, fusco-testaceous. Mandibles, anterior edge of pronotum, tarsi, and genitalia, testaceous.

This supplementary description of the male is taken from a specimen sent us by Dr. W. S. Creighton, collected at Lookout Mt., Fort Payne, Ala., and considered by him to be typical.

Aphænogaster treatæ subsp. **pluteicornis,** new subspecies

WORKER. Length 6 mm.

Differs from the typical *treatæ* in the following details: Scape usually 1⅕ the length of the head exclusive of the mandibles. Antennal lobe is about ¼ the length of

[2]The epinotal spines of the males of *A. treatæ* are probably variable likewise, although Forel (1886) says "armé de deux épines." In the type nest of *A. pluteicornis* the spines are vestigial, being represented by low rounded protuberances. Sometimes these resemble spines broken off near the base. However, small hairs have been found on the apparently broken end, and also, an adult male was discovered still inside the untorn pupal exuvium with this same rounded projection. These facts nullify the possibility of the stumps being broken spines. Another nest of this same subspecies, collected at Ivanhoe, Texas, has long slender spines on all males. Emery (1895) in speaking of *A. treatæ* males reports: "Unter den mir vorliegenden ♂ ♂ aus D. Columbia finde ich nur eins mit langen und an der Spitze stumpfen Dornen; bei allen andern, darunter 2 aus demselben Fläschen wie das bedornte Exemplar sind mir stumpfe Beulen zu sehen. Ein leider sehr beschädigtes Originalexemplar des ♂ aus N. Jersey hat kurze, stumpfe Dörnchen."

the scape. The flange bordering it posteriorly is higher and the anterior surface of the lobe next to this flange is very concave. (See Fig. 1c & 1d.) Spines on the epinotum a little longer, varying from ⅓ to ½ the base.

Hairs even more sparse; short and coarse on head, prosternum, dorsa of thorax and petiole; finer on abdomen. A few scattered, very small hairs, suggestive of rudimentary pubescence, on the gastric dorsum in addition to the usual longer hairs.

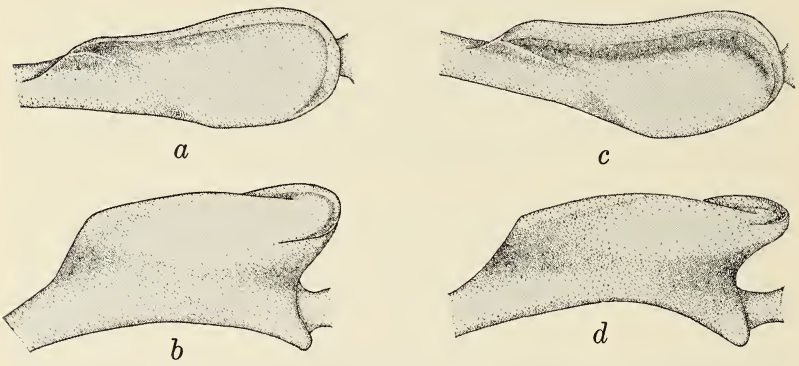


Fig. 1. *a*, left antennal lobe of *Aphœnogaster treatæ*, anterior view; *b*, lateral view of same; *c*, left antennal lobe of *Aphœnogaster pluteicornis*, var. *oklahomensis*, anterior view; *d*, lateral view of same.

Head not so coarsely rugoso-reticulate. The feeble transverse striations on the dorsum of the epinotum are almost immediately indistinguishable from reticulations. Petiole and postpetiole more faintly punctate laterally and less rugose above. Very fine reticulations of the first gastric segment extend indistinctly to the posterior edge.

Ferrugineous throughout except the abdomen which varies from ferrugino-fuscous to ferrugino-testaceous with a tendency to be lighter at the apex.

Female. Length 8 mm.

Differs from the worker in having the lobe a trifle longer in proportion to the scape. Length of head exclusive of

mandibles 1⅕ times the width. Scape shorter, 1 1-15 times the length of the head.

Sculpture coarser, gaster duller. Mesoscutum striated above longitudinally; on the mesoscutellum these ridges curve into cross striations posteriorly. Transverse striations of epinotum regular, not reticulate. Petiole rugose, reticulations becoming somewhat diagonally striated behind. Area between the reticulations punctate. Keel on the ventral surface sharp. Anterior dorsum of postpetiole reticulate, somewhat coarser and transversely striated behind. First gastric segment finely striated longitudinally at the base, merging into fine reticulations and fading out posteriorly.

Hairs relatively shorter and more abundant.

Color ferrugineous to fusco-ferrugineous, lighter specimens with darker parapsidal furrows. Metanotum, teeth of mandibles, area between ocelli, margins of thoracic sclerites, bands on the apices of gastric segments, fusco-ferrugineous; when completely retracted the lighter bands are concealed.

MALE. Length 5 mm.

Differs from the male of *A. treatæ* as follows:

Irregularly transverse ridges of the epinotal declivity fewer. Epinotal spines variable,[2] sometimes reduced to low rounded protuberances. Thorax piceous, femora and tibiae darker also.

These ants were collected by the authors in open woods (mostly *Quercus marilandica* Muench.), where the soil was a sandy loam.

Oklahoma: Poteau. VI-17-'29. Numerous workers, 1 deälated female, 3 winged females, 4 males, and a few larvæ and pupæ. On a steep slope in the soil and under dead leaves beside a stone. (Type nest.)

Oklahoma: Poteau. VII-16-'22. Small colony under a stone on a steep hillside.

Texas: Ivanhoe (Fannin County). VI-27-'29. Numerous workers, 8 deälated females; 7 winged females, 3 males, a few larvæ and pupæ. In the buried end of a small decayed branch.

Aphænogaster treatæ pluteicornis var. **oklahomensis,** new variety

WORKER. Length 5½-6 mm.

Differs from *A. treatæ pluteicornis* in the following respects: Scape 1⅕ to 1¼ the length of the head exclusive of the mandibles. Lobe ¼ the length of the antennæ and more concave next to the posterior flange, which is higher. (See Fig. 1c & 1d.) Epinotal spines about ½ the base, but variable. Epinotum more definitely striated. The first dorsal segment of the gaster more faintly reticulate. Posterior surface of the node of the postpetiole less densely punctate above. Fulvous, with head more ferrugineous, teeth of mandibles fuscous, and gaster light fulvo-fuscous.

FEMALE. Length 8 mm.

Differs from the female of *A. pluteicornis* in these characteristics: Antennæ shorter, scape 1 1/11 times the length of the head. Lobe ⅓ the scape. Posterior dorsum of the petiole more roughly reticulate, forming indefinite cross-striations. Postpetiole more rugose with a tendency to cross-striations. Fusco-ferrugineous, darker than most females of *A. pluteicornis.*

Oklahoma: Poteau, VII-16-'22. Numerous workers, 1 deälated female and a few larvæ and pupæ. Nest under a stone in the same environment as *A. pluteicornis.*

Aphænogaster treatæ pluteicornis var. **alabamensis,** new variety

WORKER. Length 5-6 mm.

Differs from *A. pluteicornis* in the following manner:

About half the workers have the scape of 1⅓ times the length of the head, the rest vary to 1¼. The anterior surface of the antennal lobe is usually convex with only a small shallow concavity near the low flange; in a few specimens it is deeper. The base of the epinotum varies from 2 to 2½ times the declivity.

The head is more coarsely reticulate. Posterior surface of the node of the postpetiole finely punctate. Sparse gastric pubescence entirely absent.

Color ferrugineous like *A. pluteicornis* or varying to ferrugino-testaceous.

FEMALE. Length 8 mm.

Like *A. pluteicornis* but with these few minor differences: Flange of the lobe a little higher; scape 1 1-11 the length of the head; color similar except that the frontal area is darker.

Alabama: Lookout Mt., Fort Payne, 12-VII-'29. Collected by Dr. W. S. Creighton.

Compared with *A. treatæ*, the head of the worker is not so coarsely reticulate, but the antennal lobe is similar except that the anterior flange is longer; the transverse striations of the epinotum usually merge sooner into reticulations which disappear between the spines, but a few specimens approach nearer *A. treatæ* in rugosity; the hairs are fewer and the color is always lighter.

This variety exhibits more variability within the nest than do our other forms of *A. treatæ*. The sculpture of the worker including the striations of the epinotum, and the shape of the antennal lobe are intermediate between *A. pluteicornis* and *A. treatæ*.

KEY TO THE FORMS OF APHAENOGASTER TREATAE

1. Lobe at the base of the antenna short, 1/5 or 1-6 the length of the scape[3] ..... 2.
   Lobe longer, 1/3 to 1/4 the length of the scape ..... 3.
2. Lobe narrow and very short, 1-6 the scape. Ferrugineous, head and abdomen slightly darker ..... *treatæ* subsp. *harnedi* W. M. Wheeler (1919).
   Lobe 1/5 the scape. Dark fuscous to piceous ..... *treatæ* var. *ashmeadi* Emery (1895)[4].
3. Lobe broadly angulate in front. Dark fuscous to piceous. *treatæ* subsp. *wheeleri* Mann (1915).
   Lobe not broadly angulate but evenly rounded ..... 4.

[3]The lobe is measured from the point where the scape begins swelling to the tip of the anterior surface, nearest the antennal insertion.

[4]Mayr (1886) first mentioned this variety but failed to name it.

4. Dark ferrugineous, head and abdomen ferrugino-fuscous above. Transverse epinotal striations extend to the spines ..... *treatæ* Forel (1886).
   Color lighter. Striations of epinotum not so extensive. Sculpture less rugose. Punctation on first gastric segment finer ..... 5.

5. Dorsum of epinotum usually reticulate, not striate. Ferrugineous, abdomen varying to ferrugino-testaceous..... *treatæ* subsp. *pluteicornis,* new subsp.
   Transverse striations present on base of epinotum..... 6.

6. Less hairy. Concavity of antennal lobe deep and flange high. Striations of epinotum very faint. Thorax light fulvous, head ferrugineous, gaster light fulvo-fuscous..... *treatæ pluteicornis* var. *oklahomensis,* new variety.
   More hairy. Concavity of antennal lobe small and flange lower. Striations of epinotum definite. Apex of postpetiole more reticulate. Coarseness of sculpture intermediate between *A. treatæ* and *A. pluteicornis.* Ferrugineous to ferrugino-testaceous ..... *treatæ pluteicornis* var. *alabamensis,* new variety.

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ON THE TICKS OF CUBA, WITH DESCRIPTION OF A NEW SPECIES, *AMBLYOMMA TORREI*, FROM *CYCLURA MACLEAYI* GRAY.[1]

By J. Pérez Vigueras

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In the literature on Ixodoidea I find the following information relating to species recorded from Cuba.

F. J. Balmaseda (Enfermedades de las aves ó Ensayo sobre Patornitología y consideraciones sobre Higiene Pública en la Isla de Cuba. Havana, 1889) cites two species: "*Ixodes reticulatus*" (pp. 272 and 275) on cattle, and "*Ixodes ricinus*" (p. 272) on dogs.

G. Neumann (Mém. Soc. Zool. France) records *Rhipicephalus annulatus* (1897, p. 412); *R. bursa* (1897, p. 393); *Amblyomma cajennense* (1899, p. 208); *A. tuberculatum* (1899, p. 236); *A. albopictum* (1899, p. 244); *Rhipicephalus annulatus,* typical (1901, p. 279); and *R. annulatus* var. *microplus* (1901, p. 280).

C. W. Stiles and A. Hassall (U. S. Dept. Agric., Bur. Anim. Ind., Circ. No. 34, 1901, p. 3) cite *Boophilus australis* as present in Cuba.

Nuttall, Warburton, Cooper and Robinson (A Monograph of the Ixodoidea, 1908-1926) repeat in part the records given by Neumann.

A publication issued by the Secret. Agric. Com. y Trab., Habana, (Circ. No. 57, 1919, p. 7) states that "*Boophilus annulatus* or *Margaropus annulatus*" is the most common species.

N. S. Mayo (First Annual Rept. Agric. Exp. Sta. Cuba, 1906, p. 44) lists from Cuba *Dermacentor nitens, Margaropus annulatus,* and *M. annulatus australis;* and later (Second Rept. Agric. Exp. Sta. Cuba, 1909, p. 27), he also mentions *Rhipicephalus texanus* as a Cuban species on dog.

[1]Translated, from the original Spanish MS, by J. Bequaert.

W. A. Hooker (Jl. Econ. Entom., II, 1909, p. 415) gives a list of the ticks known at the time from Cuba. He repeats most of the previous records and includes the following species of which he saw Cuban specimens in the collection of the U. S. Bureau of Entomology: *Amblyomma albopictum, Argas miniatus, Margaropus annulatus, Ornithodoros marginatus* (Banks, MS. name).

In 1910 (Proc. Ent. Soc. Washington, XII, p. 6), N. Banks describes *Ornithodoros marginatus,* from a cave in the Guanajay Mountains, Cuba (collected by Palmer and Riley), and also from a West Indian bat (collected by Barrett, probably in Porto Rico).

The foregoing data might call for some discussion, but I prefer to give the following brief summary.

1. *"Ixodes reticulatus"=Dermacentor reticulatus* (Fabr., 1794). It is evident that Balmaseda used this name for the ticks he found on cattle, because *"Ixodes reticulatus"* is the best known tick name. The presence of this species in Cuba could only be explained as accidental, through introduction with cattle from Europe. Given this possibility and in view of its origin, this species should be struck out from the Cuban list.

2. *"Ixodes ricinus"=Ixodes ricinus* (Lin., 1758). Up to the present the occurrence of this tick in the island has not yet been positively established. It seems certain that Balmaseda cited it only because he was familiar with the name.

I mention the foregoing two species only because they have appeared in print.

3. *Amblyomma albopictum* Neumann, 1899. The occurrence of this tick in Cuba has been confirmed.

4. *Amblyomma cajennense* (Fabricius, 1787). This species is very common in Cuba.

5. *Amblyomma tuberculatum* Marx, 1894. This tick was collected by Gundlach and identified by Neumann. Dr. Bequaert is of the opinion that Gundlach obtained his specimens off gopher turtles brought to Cuba from the United States, where the species is indigenous. In view of this, this tick must be eliminated from the Cuban list.

6. *Rhipicephalus annulatus, R. annulatus* var. *microplus,* and *Boophilus australis* all refer to *Boophilus microplus* (Canestrini 1888), in so far as the species of Cuba is concerned.

7. *"Margaropus annulatus* or *Boophilus annulatus."* I have searched for this tick with special care, examining lots coming from many different parts of the island, but I have never seen it. If it occurs on cattle imported from the United States, it must be very rare.

8. *Dermacentor nitens* Neumann, 1897. The occurrence of this tick in Cuba is certain.

9. *Argas miniatus* Koch, 1844. This name is now regarded as a synonym of *Argas persicus* (Oken, 1818), which is well known as a Cuban tick.

10. *Ornithodoros marginatus* N. Banks, 1910. Dr. Bequaert, who saw cotypes in Mr. Banks' collection at the Museum of Comparative Zoölogy, Cambridge, Mass., informs me that it is an extremely remarkable species. As Mr. Banks states, it is "readily known from all other species by the row of tufted humps on margins of body." It probably is peculiar to West Indian caves, where it doubtless feeds on bats.

11. *Rhipicephalus bursa* Canestrini and Fanzago, 1877. This is mainly a tick of the Old World, where it is found on cattle, horses and other hosts. It is rather similar to *R. sanguineus,* and it is possible that the specimens seen by Neumann from Cuba were that species and not the true *R. bursa.* In any case, the record needs confirmation and I do not therefore include the species in my list. It should be noted that Neumann did not mention *R. sanguineus* from Cuba.

12. *Rhipicephalus texanus* N. Banks, 1908. The correct identity of this species is open to question. The Cuban specimens which Mayo referred to it, were, however, beyond doubt *R. sanguineus,* the common dog-tick of the island.

I shall now give a list of the species of ticks at present positively known to occur in Cuba, with the hosts on which they may be found, as well as the localities.

IXODOIDEA Banks, 1894
I. *Argantidæ* Agassiz, 1846
G. **Argas** Latreille, 1796

1. *A. persicus* (Oken, 1818) Fischer, 1827.—Host: *Gallus gallus*. Localities: Provinces of Havana, Matanzas, and Santa Clara. This species has been known in the island for many years. The country-people call it and its larvae "*garrapatillas*." As in other countries, it has been shown rather frequently in Cuba that this parasite transmits spirochetosis of poultry.

G. **Ornithodoros** Koch, 1844

2. *O. megnini* (Dugès, 1883) Neumann, 1896. Host: *Equus caballus*. Locality: Province Havana. It does not appear to be common. I have only encountered it once, on a native horse, and I cannot assure that it is actually indigenous. If it is shown later not to be indigenous, it should be struck out from the list.

3. *O. marginatus* Banks, 1910. Locality: Guanajay Mountains, Prov. Pinar del Rio. It is restricted to bats. Two larvae, possibly of this species, were taken by Mr. P. Bermudez off a bat, *Eumops glaucinus* (Wagner), at Caibarien, Prov. Santa Clara.

II. *Ixodidæ* Murray, 1877
G. **Dermacèntor** Koch, 1844

4. *D. nitens* Neumann, 1897.—Hosts: *Equus caballus, Bos taurus,* and also *Epicrates angulifer* Bibron. Localities: Provinces of Havana, Pinar del Rio, Santa Clara, Matanzas, and Camaguey. This tick was first recorded from Cuba by N. S. Mayo (1906). It is widely distributed over the entire island. I have found it parasitizing indiscriminately equines and bovines, but more particularly the former, in the ears, in the region of the anus and perineum. I have found it also once on a "Majá de Santa María" (*Epicrates angulifer*) captured at Calabazar de Sagua (Prov. Santa Clara).

G. **Rhipicephalus** Koch, 1844

5. *R. sanguineus* (Latr., 1806) Koch, 1844.—Host: *Canis familiaris*. Localities: Provinces of Havana, Ma-

tanzas, and Santa Clara. This is the common dog-tick of Cuba, widely distributed, probably, over the entire island. I have not seen it outside the provinces mentioned.

G. **Boophilus** Curtice, 1891

6. *B. microplus* (Canestrini, 1888). Hosts: *Bos taurus, Equus caballus.* Localities: Provinces of Havana, Matanzas, Pinar del Rio, Santa Clara, and Camaguey. This species has been recorded by various investigators (Neumann, Stiles, Bequaert). It is the common tick of our cattle. I have taken specimens from deer ("venado"), *Odocoileus virginianus,* at Artemisa, Prov. Pinar del Rio.

G. **Amblyomma** Koch, 1844

7. *A. cajennense* (Fabr., 1787) Koch, 1844. Hosts: *Equus caballus, Bos taurus.* Localities: Provinces of Havana, Pinar del Rio, and Santa Clara. This, as well as *Boophilus microplus* and *Dermacentor nitens,* are our most common ticks, which parasitize cattle.

8. *A. albopictum* Neumann, 1899. Host: *Cyclura macleayi* Gray. Locality: Province of Havana. The species was first described by H. Lucas (1852; as *Ixodes variegatus*), from specimens collected near Havana by Gundlach. The present author has also found it.

9. *Amblyomma* species? (near *scutatum* Neumann, 1899). Hosts: *Bufo peltacephalus* Tschudi (vernacular name: "sapo"), *Cyclura macleayi* Gray. Localities: Provinces of Havana (Laguna de Ariguanabo) and Oriente (San German; collected by M. Jaume). The true identity of this tick is as yet undecided. According to Dr. Bequaert, it is quite different from *A. dissimile* Koch, and possibly represents an undescribed species.

10. *A. torrei,* new species. Host: *Cyclura macleayi* Gray (*carinata* of authors; vernacular name "*iguana*").

Locality: Province of Havana.

Description: *Amblyomma.*

Male: Length, 3.2 mm.; greatest width, 3 mm. Body slightly oval, without marginal groove; cervical groove short and deep; eyes of median size, not orbited, quite apparent; scutum convex, ornate; eleven quadrangular festoons; five ventral plates; dentition 3:3.

Scutum convex; color pale chestnut, with two large and continuous pale spots, placed symmetrically on each side; each spot occupying about one-third of the total length, and extending without interruption from the outer half of the scapular angles to the first two festoons. The pale chestnut fringe extends without interruption from the internal half of the scapular angle to the festoons 3-7, narrowing in its posterior two-thirds like a belt, and continuing without interruption, but with a very irregular inner border, along the margin to the eye. In the pale areas there is a narrow green band, which in the center is of a pale porcelanous violet color and toward the outside with a yellowish tinge and small green spots. Festoons as wide as long. Dorsum with fine, uniformly distributed punctures. Venter glabrous; genital orifice slightly anterior to coxa II; anus one-third of the total length from the hind margin. Stigmal plate subtriangular, with rounded angles. Five ventral plates, nearly circular, placed approximately opposite the festoons 2, 4, 6, 8, and 10. Coxa I with one triangular, median spur and another short spur, a little projecting from a broad base. Coxa II with a triangular spur, but smaller than that of coxa I. Coxa III with a spur similar to that of coxa II, and a slightly marked projection on its base. Coxa IV with a spur similar to that of coxa III, and a projection or raised portion, slightly marked at the base. Tarsi gradually attenuated. Capitulum 1.2 mm. long; basis capituli 0.56 mm. long and 0.76 mm. wide. Palpi 0.8 mm. long; segment I short; segment II, 0.32 mm. long; segment III, 0.24 mm. long; segment IV rudimentary. Hypostome dentition 3:3.

Female: Unknown.

The species is dedicated to the learned Naturalist, Dr. Carlos de la Torre y Huerta.

[*Note.*—The collection of the Museum of Comparative Zoölogy contains two males of *A. torrei,* taken off *Cyclura macleayi* Gray, in the valley of Luiz Lazo, Prov. Pinar del Rio, Cuba, by Dr. C. de la Torre and Dr. Thomas Barbour. I have compared them with a paratype, kindly sent by Dr. Vigueras, and they agree in every respect.—J. Bequaert.]

NOTES ON A PSYCHID NEW TO NORTH AMERICA (*FUMEA CASTA* PALLAS, Lepidoptera: Psychidæ)

By Donald W. Farquhar[1]
Harvard University

In 1931, workers from the Gipsy Moth Laboratory in Melrose Highlands, Massachusetts, found examples of an unknown case-bearer associated with the introduced beech scale, *Cryptococcus fagi* Bar., near Jamaica Pond, Boston, Massachusetts. Specimens of the case-bearer brought into the laboratory were observed to feed on the eggs and agamic females of the scale, but since this choice of food was decided to be purely incidental and the chief interest of the laboratory was in the scale rather than in the case-bearer, no further work on the latter was done. The writer, however, was interested in the identity of the insect and sent examples of the cases to Dr. Frank Morton Jones of Wilmington, Delaware, who was unable to place them among any of the known North American forms and suggested that an attempt be made to secure adults. In 1932 two male adults were obtained, and in 1933 over 2,000 adults of both sexes were reared from larvæ collected just prior to pupation; this ample material enabled careful study, resulting in the determination of the insect as the European *Fumea casta* Pallas. A discussion of the characters establishing its identity is given in the paper which follows, while the present paper deals with the distribution and biology.

[1]The writer wishes to express his deep appreciation to Frank Morton Jones, specialist in the Psychidæ, who has been most generous in giving of his time and knowledge. A paper which follows, and which bears the name of the writer of the present paper as coauthor, is almost entirely Dr. Jones' own work.

Thanks are also given to Harold Morrison, C. F. W. Muesebeck, A. B. Gahan, and R. A. Cushman, all of the taxonomic unit of the Bureau of Entomology, who examined parasitic material and made determinations where possible.

In the Old World, *Fumea casta* Pall. is widely distributed in England, on the European mainland, in Asia Minor and Algeria. The first specimens discovered in North America were found between Jamaica Pond and the Arnold Arboretum, in Boston, Massachusetts; and subsequent scouting showed this region to be near the center of an area of some 50 square miles (Fig. 1), heavily infested at the center, and

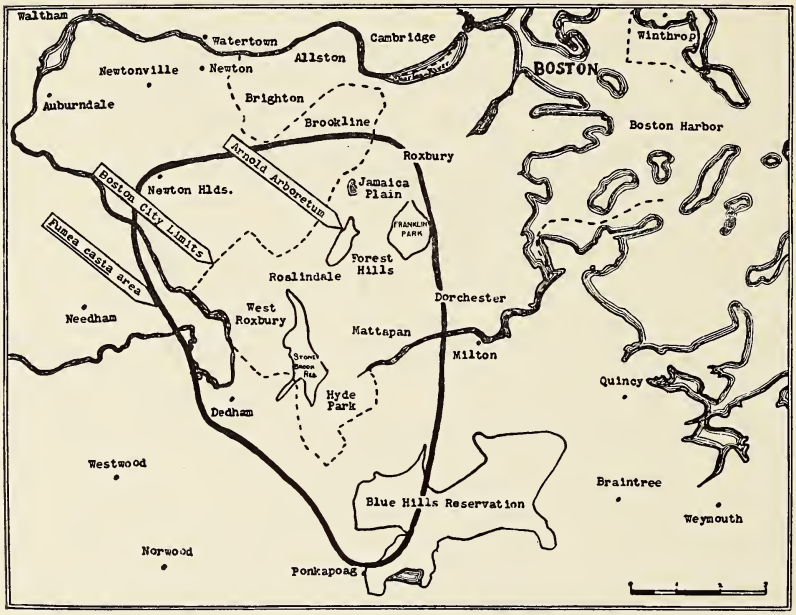


Fig. 1. Map showing regions in Boston and vicinity infested with *Fumea casta* Pall.

gradually diminishing in density toward the edges. Approximately half of the area comprised those sections within the limits of the City of Boston known as Jamaica Plain, Forest Hills, Roslindale, West Roxbury, Hyde Park, Mattapan, the Arnold Arboretum, Stoney Brook Reservation, and Franklin Park; the remaining 25 square miles were in Brookline, Newton Highlands, Dedham, Milton, and the Blue Hills Reservation. A second, and far removed, colony was later found by Dr. Jones in the Morris Arbore-

tum, near Germantown, Pennsylvania; females from this colony readily mated with Massachusetts males; many of the older plantings in the Morris Arboretum are said to have originated in the Arnold Arboretum, which may explain the mode of introduction. A third colony is indicated by empty cases, apparently identical with those of Fumea, found by Dr. W. T. M. Forbes in Bancroft Woods, in Worcester, Massachusetts. Other colonies are to be anticipated.

Larva and Case. The larvæ hatch during June and early July, and at once each individual constructs a small silken case, or "bag," in which, enlarged from time to time, it spends its entire larval and pupal period. This elongate bag is adorned on the outside with bits of grass and other ground debris, longer pieces being attached lengthwise and often projecting slightly beyond the posterior end of the bag. Through an anterior opening, the larva is able to thrust out its head and thorax for purposes of feeding, moving, or working on the case; the posterior end of the case has a smaller opening, usually collapsed but readily opened from within for the expulsion of excrement. During resting and molting periods the anterior edge of the bag is firmly attached by silken threads to some object of support.

Food is taken only during the larval period, and consists chiefly of grasses, mosses, lichens, and other low plants, although the insect may occasionally exhibit carnivorous tendencies, as evidenced by feeding on scale insects and, in the laboratory when very hungry, on the living larvæ and helpless adult females of its own species.

As in many other members of this family, the larval period is very protracted (Fig. 2)—occupying approximately eleven months—and growth is correspondingly slow. From the time of hatching in June or July until the onset of winter, the larval case attains a length of but three millimeters. Hibernation takes place in crevices in the bark of tree trunks, or beneath stones, branches of trees, and other objects resting on the ground. In the spring, feeding is resumed, and growth is more rapid. When the larvæ are mature, in late May and early June, the cases of the females are generally larger than those of the males. Measurements of fifty female cases at this time, inclusive of the loose ma-

terial projecting beyond the end of the case proper, showed a range in length from 8 to 16 mm., with an average of 12.1 mm.; measurements of the same cases, exclusive of the loose material, ranged from 7.5 to 10 mm. with an average of 8.8 mm. Fifty male cases ranged from 7.5 to 13.5 mm., with an average of 10.2 mm., inclusive of the loose material; when measured without the loose material, these male cases ran from 6.5 to 8 mm., with an average length of 7.5 mm.

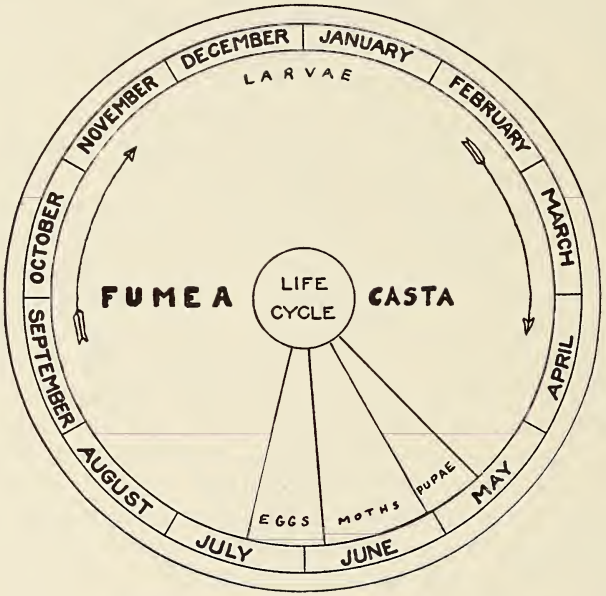


FIG. 2. Life cycle of *Fumea casta* Pall. in Massachusetts.

When the larvæ become full grown, they forsake the ground and low plants on which they have spent their entire lives up to this point, and climb up tree trunks, telegraph poles, fence posts, stone walls, sides of dwellings, etc., to attach their cases for pupation. The height to which the larva ascends before attaching the case varies from a few inches to twenty feet, but few are attached above six feet. Although the larvæ on the ground easily escape notice even in densely populated colonies because of

the close resemblance of their cases to the surroundings, the cases attached for pupation are conspicuous and often render unsightly the objects of attachment.

Pupa. Like the larval period, the pupal period is passed within the bag. After firmly attaching the bag and closing its anterior end in preparation for pupation, the larva reverses its position within the bag so that its head comes to lie at what was previously the bag's posterior opening. Rarely, the larva fails to reverse its position, but in such instances the adult is unable to escape from the bag and perishes within it.

The pupæ of the two sexes are quite different in appearance. That of the male measures from 4.5 to 5 mm. in length, and has the general appearance of orthodox moth pupæ. That of the female measures 5.3 to 7.5 mm. in length, and is noteworthy because of the marked reduction in size of the antennæ, wings, and legs, all of which occupy a very limited area of the anteroinferior portion of the pupa.

In both sexes, when the pupa is ready to yield the imago, it squirms forward in the bag until the head of the pupa projects from the bag's opening; in the male this squirming continues beyond the stopping place in the female, until not only the head projects, but also the thorax and three to five segments of the abdomen. In this position the adult emerges.

The duration of the pupal period is about twelve days in the male, and about seven days in the female.

Adult Male. (Plate 2, figs. C and F.) The male moth is uniformly dark brown in color, and is provided with strong wings to which the scales are loosely attached. The alar expanse varies from 10.5 to 13 mm. (Chapman and Tutt give measurements of 9-15 mm. for European *casta.*) No food is taken by the adult, and the duration of life is but a very few days at most.

Adult Female. (Plate 2, figs. A and B.) In the higher Psychidæ, to which all the North American Psychids belong with the exception of *Solenobia walshella* Clem., the females are maggot-like and devoid of antennæ, eyes, and legs. In the lower or less specialized Psychidæ, the females

are provided with functional legs, antennæ, and eyes. In this latter group belong the native *Solenobia walshella* and the introduced *Fumea casta*. The female is wingless, and the body is practically naked save for a thin scattering of pale hairs and a dense ring of pale, silky hairs at the end of the abdomen surrounding the base of the long, extensible ovipositor. After the female *casta* has feebly squirmed her way out of the pupa-shell, she takes up her waiting posture at the lower end of the bag, still maintaining contact with the interior of the bag by means of her metathoracic legs; often her head, antennæ, and prothoracic legs remain encased in the corresponding parts of the pupa-shell which are broken away from the rest of the shell during emergence. Like the adult male, the adult female takes no food, and her life in this stage is limited to a very few days.

Mating. Immediately after emerging, the female liberates the attractant which summons males within perceiving distance. A male receiving this attractant evidences its perception by becoming suddenly very much excited. He takes flight and follows an erratic course in the direction of the female. Seldom is the sense of perception sufficiently keen to enable a flight direct to the object of search; the usual course is to fly to the general vicinity of the female, then after alighting, with vibrating antennæ and quivering wings, the male continues his quest on foot. His excitement increases in pitch when he attains the bag on which his mate is waiting, and he usually makes several impetuous attempts to clasp nearby objects before making successful contact with the female genitalia. The commencement of copulation is indicated by the male suddenly becoming quiescent, resting with the wings sloped sharply downward (in a "sloping-roof" posture). Seven timed matings indicate a copulation period of six to thirty-eight minutes, with an average of 20.4 minutes. Both sexes may mate more than once, although such successive matings in the female usually occur only when the original mating has been interrupted before completion.

Eggs. As soon as mating is completed, the female probes with her ovipositor to reinsert it in her empty pupa-shell, which lies within the bag; in this process of probing she is

assisted by the metathoracic legs, the tibia and tarsus of which are still within her bag, and probably facilitate the reinsertion of the ovipositor by acting as a guide. The eggs are pale in color and very delicate, and are deposited by means of the extremely manœuverable, telescopic ovipositor, which, when fully extended, equals the length of the remainder of the female's body. When the last of her 150-odd eggs have been deposited, the female withdraws her ovipositor, closing the opening to her egg-filled pupa-shell with a plug of fuzz from the tip of her abdomen; she then relinquishes her hold on the bag, and drops to the ground to die. The eggs hatch in thirteen to fifteen days, the young larvæ leaving the parental bag via its open end.

Dispersal. Since the adult female is incapable of flight or other locomotion, the dispersal of the species depends on the wanderings of the larvæ, and especially their transportation by other agencies. Just as human beings have unwittingly brought this insect to America, so, too, its dispersal within America is probably greatly assisted by man's conveyances. Another factor in the dispersal is the wind; as soon as the newly hatched larvæ have constructed their tiny cases, they have the habit of dropping themselves down on a silken thread, in which condition they are easily picked up by wind currents to be dropped perhaps at some distance away. Since evidence indicates a sojourn of the insect in this country of at least two decades, with these various factors aiding in its distribution, the insect probably will soon be found in many, and possibly widely separated localities.

Parthenogenesis and Preponderance of One Sex. Although parthenogenesis has been recorded in the genus Fumea in Europe—and, indeed, has been reported in *Fumea casta* (Fauna Boica II, 91, Schrank)—no evidence of this phenomenon has been observed in Massachusetts *casta*. Fifteen unmated females from the Boston colony were isolated in an experiment designed to detect evidences of parthenogenesis. All died without ovipositing, within five days after emergence.

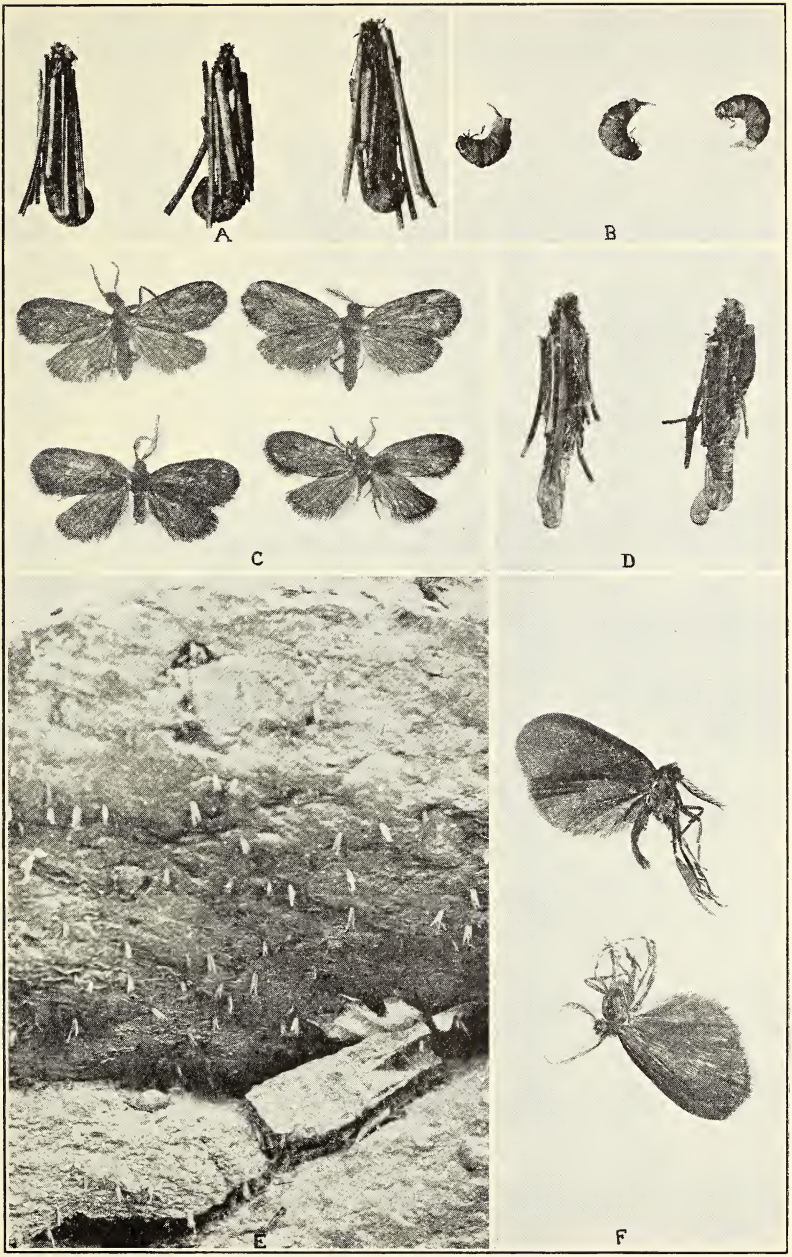
In both Europe and America, authors have remarked upon the occasional striking preponderance of one sex over

the other in Psychid rearings. In parthenogenetic species, females are either the only form known or greatly outnumber the males. In America, Dr. Jones has mentioned (Tr. Am. Ent. Soc., LIII, 310, 1927) a collection of thirty-odd cases of *Eurukuttarus edwardsi* Heyl. of which only one was female; the same author (Ent. News, XXXIII, 130. 1922) bred some forty males without a single female from a collection of *Psyche celibata* Jones. Returning to *Fumea casta*, a similar numerical ration between the sexes was found in many of the Massachusetts collections, as shown in the following table based on adults bred from cases collected at time of pupation; where cases failed to yield adults, they were opened and the sex determined from the enclosed pupæ; in those few cases where the larvæ died, accurate sex determination was not considered possible, and such individuals are ignored in the tabulation:

TABLE 1.—Sex ratio in certain collections of *Fumea casta* in Massachusetts.

Date of collection	Place of collection	Number of individuals	% ♂ ♂	% ♀ ♀
May 6, '33	Arnold Arboretum	7	100	000
May 6, '33	Stoney Brook	70	100	000
May 12, '33	Stoney Brook	69	100	000
May 13, '33	Arnold Arboretum	100	100	000
May 22, '33	Arnold Arboretum	130	100	000
May 22, '33	Fenway	25	100	000
May 22, '33	Jamaica Pond	100	93	7
June 5, '33	Jamaica Pond	375	34	66

Interpretation of the above table is complicated by the fact that the Jamaica Pond colony was some two weeks behind the other colonies in reaching maturity; in fact, for a time the larvæ of this colony were considered as possibly of another species because of their smaller size. Therefore, the high percentage of females in the latest collection does not necessarily mean that similar results would have obtained if later collections had been made at the other sites. It appears from the table that the earliest larvæ to pupate are the males, which conforms with the condition in many other Lepidoptera. The striking preponderance of males



Farquhar—*Fumea casta*

may be due to some peculiar habit of the female in choosing different or more concealed places for pupation than the males, thus rendering their cases less liable to detection by the collector.

Parasites. Apparently *Fumea casta* has become established in America without its European parasites. Although the writer reared over 2,000 adult moths from cases collected at the time of attachment, only eleven parasites emerged from the material, and probably all eleven of these emerged from a single host. They proved to be a new species and genus of Eulophidæ related to *Elachertus,* as yet undescribed. Several hundred cases collected in Massachusetts were sent to Dr. Jones, and from them he reared eleven specimens of *Dibrachys boucheanus* (Ratz.) [A. B. Gahan]. Dr. Jones also reared two specimens of *Itoplectis conquisitor* (Say) [R. A. Cushman] from cases collected in the Morris Arboretum in Pennsylvania.

In addition to these definite instances of parasitism, two species were found in the field associated with *Fumea casta*: A female of *Ephialtes equalis* (Prov.) [R. A. Cushman] was taken in the field with its ovipositor thrust through a bag attempting to oviposit in the contained pupa. A specimen of *Eunotus lividus* Ash. [A. B. Gahan] was found in a tube in which cases of *casta* were being collected, and probably gained entrance to the tube by being on or within one of the cases when it was collected.

Explanation of Plate 2.

Fig. A.—Adult females on their bags (x2).

Fig. B.—Adult females (x2).

Fig. C.—Adult males (x2½).

Fig. D.—Bags from which adult males have emerged leaving their empty pupa-shells protruding from the bags (x2½).

Fig. E.—Bags attached for pupation on a stone wall in a heavy infestation (⅓ natural size).

Fig. F.—Adult males (x3½).

THE IDENTITY OF AN INTRODUCED PSYCHID, *FUMEA CASTA* PALLAS (Lepidoptera, Psychidæ)

By Frank Morton Jones and Donald W. Farquhar

When in 1931 the larvae and larval cases of this small Psychid were first observed in the Boston area in Mass., it was apparent that the insect could not be identified with any known North American species of the family. A very few adult males were secured in 1932, and these sufficed to refer the insect to the European genus *Fumea,* hitherto unrecognized in the western hemisphere, and to indicate that we were dealing with an introduced species. Abundant material of both sexes, bred in 1933, confirmed the generic reference and permitted a careful comparison with exotic material and the literature of the genus. Since the insect has already extended its range in two States and is destined to take permanent place in our fauna, it seems advisable, in addition to the biological notes included in the preceding paper, to put on record those details of its structure which should suffice for its ready recognition in this country.

Fumea, in much of its extensive European literature, obviously has been made to include species structurally divergent, and even under identical specific names there has been such lack of agreement that mixed series or mistaken identities seem the only explanation. We have profited by the careful work of Chapman, of Tutt, and of Burrows, and have accepted their identifications of *casta* Pallas, the most abundant and widely distributed species of the genus, as the basis of our comparisons. That some of the characters we describe and illustrate should be generic rather than specific, is necessitated by the confusion of literature we have indicated. In addition to the general habitus of the insect, we have found useful for comparison the following characters:

Venation, wings of male (Plate 3, fig. 1).—This Psychid is an 11-7 veined insect. In both wings the media divides

the cell and does not fork within the cell. On the fore wing, the 1st anal does not reach the margin, and the 2nd and 3rd anals, coincident from near the base, extend to the margin without fork or branch; some variation exists in the origin of the two lower radials, which may arise from a point at the cell, may be shortly stemmed to the cell, or may be separated at their origins on the cell.

The hind wing has three anal veins, the 2nd sometimes tending toward union with the 1st by exhibiting a slight angulation and trace of a spur; the radius and subcosta are not joined beyond the base; M_1 may arise as in the figure, or as a direct continuation of the media.

This is all in accord with *Fumea casta* as illustrated by Chapman, but not in agreement with *Bruandia* and *Proutia* (which have media of fore wings forked within the cell), included under *Fumea* by Seitz.

Legs of male (Plate 3, fig. 5).—In *Fumea* and its allies the length of the anterior tibial spur (the epiphysis) has been extensively used in the separation of genera and species. Chapman's measurements, thus used and quoted, though designated as spur ratios, really relate to "the ratio of the length of the tibia beyond the origin of the spur, to the whole length of the tibia." For *Fumea* (excluding *germanica*) Chapman gives this ratio as .77-.81. This range is evidently too narrow, for Burrows, who inherited Chapman's collection and added to it, measured 236 *Fumeas* (including Chapman's series), and found a ratio range of .72 to .81. Evidently the method of preparation and measurement, as well as individual variation, affect the rigid application of this character.

Balsam mounts of the legs of Massachusetts *Fumeas* give us an average ratio of .76, with a minimum and maximum of .72 and .79.

Legs of female (Plate 3, fig. 6).—These agree with *casta* in having five joints to the tarsi of all legs. A single vestigial apical spur is sometimes present on the fore tibia, rarely present on the mid-tibia; may be present on one tibia, absent from the corresponding opposite tibia of the same insect. When present, it varies in shape from almost globular to elongate with a length twice its diameter. These

conditions prevail in both English and American examples.

In both sexes, irregularity exists in the relative length of the legs (the third pair always the longest), due chiefly to the variability of the first tarsal joint.

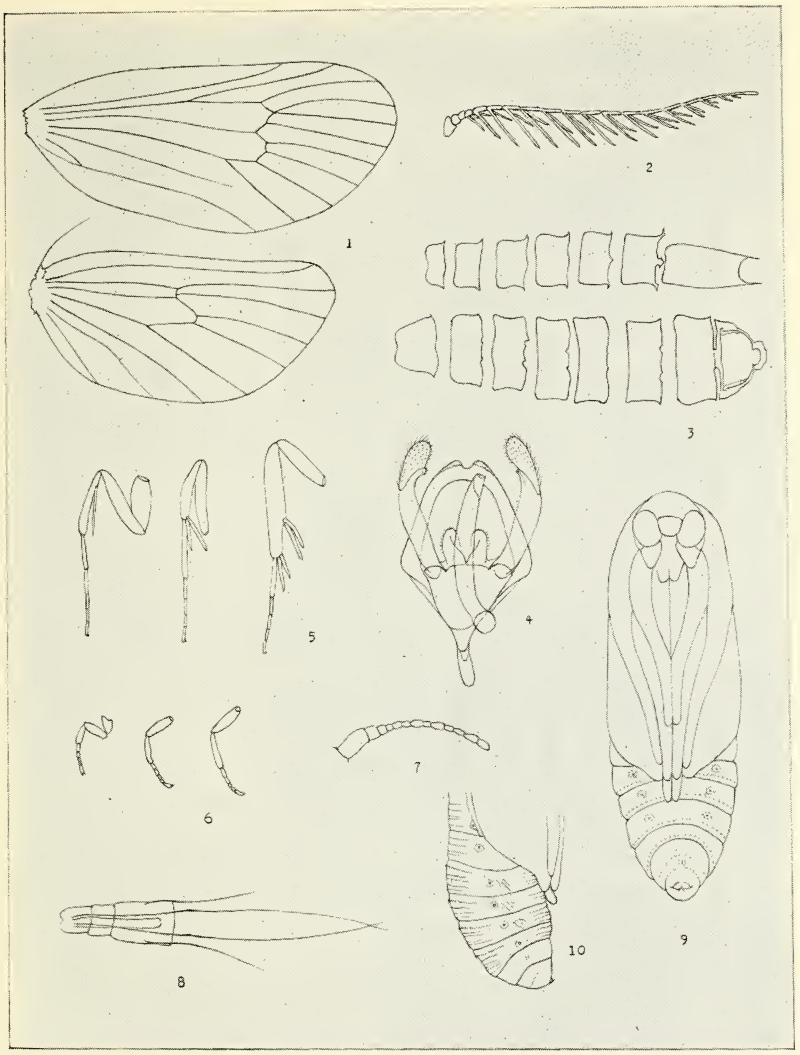
Antenna of the male (Plate 3, fig. 2).—Bipectinate from the third or fourth joint. The third joint, sometimes showing a short pectination, is usually more or less fused with the fourth; and the distal joint may be simple or bipectinate, according to its degree of fusion with the next. The longest pectination (balsam mount) measures .52 mm. The shaft and dorsum of the pectinations are clothed in appressed scales (these and the fine hairs of the pectinations not shown in the figure). The apparent number of antennal joints is usually 20, but these by fusion may be reduced to 18 or 19, and in one instance we were able to count 21 joints.

Antenna of female (Plate 3, fig. 7).—Simple, bead-like, consisting of 13 joints of irregular size. Occasionally 14 joints may be detected.

Abdominal plates and genitalia of male (Plate 3, figs. 3 and 4).—By direct comparison we detect no essential differences in these structures, between our Massachusetts insects and *casta* as identified by English entomologists.

Ovipositor of female (Plate 3, fig. 8).—The ovipositor is capable of extrusion until it equals the entire length of the remainder of the insect. Balsam mounts of the female abdomen show prominently three sets (of 2 each) of hair-like black rods, which function in the telescopic mechanism. Mounts from English *casta* show these rods to be identical in number, shape, and position with those of Massachusetts insects; and this apparent identity extends to *relative* length of the three sets, with such exactness that specific identity of the insects seems assured. Preparations by identical technique, drawn and measured at the same magnification, for the three sets of rods give these ratios of length:

5 English *casta*, from the Chapman and Burrows collections	36 : 48 : 147
3 Massachusetts *casta*	36 : 50 : 147



Some Structures of an Introduced Psychid
(*Fumea casta*, Pallas)

1. Venation of male (10x)
2. Antenna of male (12x)
3. Abdominal plates of male (12x)
4. Genitalia of male (37x)
5. Legs of male (10x)
6. Legs of female (10x)
7. Antenna of female (27x)
8. Rods of ovipositor (10x)
9. Male pupa, ventral view (11x)
10. Male pupa, lateral view (11x)

Pupa of male (Plate 3, figs. 9 and 10).—In the male pupa of *Fumea,* the fore wings, the legs, and the antennæ are free at their apices, standing out slightly from the abdomen, so that according to the degree of its extension they may overlap the fifth abdominal segment or may barely reach its anterior margin. As far as we have been able to make comparison, the general characters of the pupa as shown by our illustration are in accord with English *casta.*

We are aware that the form of the generic name (Tutt, British Lepidoptera, II, 317, 318, 1900), its genotype, and the properly included species, are all subjects for differences of opinion and will require review, and that in the European literature the status of *casta* Pallas, with reference to its synonyms, its geographical races, and the number of possibly distinct but closely related species remains a matter of opinion. Tutt follows Chapman in treating *intermediella* Bruand as a race intergrading with *casta,* while Seitz considers *intermediella* a pure synonym. By Tutt's analysis, in this "protean species represented by various local races," our insect in size and structure comes nearest to variety *intermediella,* which is supposed to be of more frequent occurrence on the European mainland rather than in England. In view of the impossibility of determining the place-origin of our insect and of the intergradation of the partially localized and illy-defined varieties or races of *casta,* we believe that for the present this recent addition to our fauna may be most satisfactorily designated in our literature by the oldest and best-known name for this widely-distributed insect, *Fumea casta* Pallas.

SPIDER BITE BY OLIGOCTENUS (Fam. CTENIDÆ)

By L. F. Pinkus,
High School, St. Louis, Missouri

During June, 1929, a student brought into the laboratory a spider which has been identified by Prof. A. Petrunkevitch as a new species of Oligoctenus of the family Ctenidæ. According to Comstock the members of this family wander about in search of their prey and are active mainly at night. Some of the tropical species are very large. They make no webs for a dwelling, but some species appear to inhabit burrows in the ground.

My specimen was taken from a bunch of bananas, so its real origin could not be determined. It was placed in a rather large insectarium, of which the bottom was filled with earth. The spider was very inactive most of the time and hid in the corners of the container.

After about two weeks it was brought home because of the close of school. A visitor, noticing the cage, inquired what might be seen there and in order to show off my trophy I opened the cage and pushed the spider with the index finger of my left hand, in order to induce him to move about. Instantly I was bitten.

Here are my notes concerning the effects of this bite:

June 12, 1929:—4.30 P. M.—Bitten by spider (Oligoctenus) on index finger of left hand. Index finger swelled. The instant piercing pain was quite severe. After approximately ten minutes the swelling had covered the whole finger. The finger was numb, but painful with a prickly crampy sensation, interrupted by throbbing, jerky pains. A little dizziness accompanied this, and after fifteen minutes, for just a few seconds, became quite severe, and perspiration collected on my forehead. My lips became blue for a short while and the pain continued intense for about an hour. After two hours the swelling extended over a larger area of the hand, covering the index finger and the greater part of the back of the hand and reaching all the way over to the metacarpals of the third finger; in other words, leaving free only the metacarpal and phalangeal region of thumb

and little finger. By this time the intensity of the pain had diminished, there was no discoloration, while the temperature of the swollen area rose to some extent. At this time the prickling pain was accompanied by a slight burning sensation in the region of the greatest swelling, which had enlarged the knuckle of the index finger to twice its original diameter. During all this time I was unable to bend the first three fingers of my left hand.

June 13, 1929—6.30 A. M.—On awakening, I found that the swelling had subsided considerably, but the numb feeling still extended over the same area. The pain was the same prickly sensation as when a limb has "fallen asleep," as the popular saying is.

4.30 P. M.—Swelling entirely disappeared. No pain.

For scientific records pertaining to spider bites and their effects one should recall the admirable and heroic experiments of Dr. Baerg and his experiences with the Tarantula and Black Widow.

I offer this record as an addition to the few scattered records pertaining to spider bites. No medical attention was administered, and the only treatment given was to place the hand in warm water, which somewhat relieved the pain.

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NEW LYCOSIDÆ FROM FLORIDA

By Elizabeth B. Bryant

Museum of Comparative Zoölogy, Harvard University

Through the kindness of Mr. H. K. Wallace of the University of Florida, I have had the opportunity to examine a collection of spiders made by him. Among them are three species that are new. The types are deposited in the Museum of Comparative Zoölogy collection.

Lycosa carrana sp. nov. (Fig. 1)

♂ 10.5 mm. long, ceph. 5.6 mm., abd. 5.5 mm.
1 leg, 16. mm., IV 21. mm.

Cephalothorax light yellow, the black about eyes is continued from p.l.e. as two parallel stripes of dark hairs to posterior margin, median light stripe wider than dark stripes, a narrow marginal dark stripe, a narrow line of white hairs between p.m.e. which does not extend to margin of clypeus; abdomen with a wide median dark stripe on posterior half which is continued as two converging lines forward to near the anterior margin, a stripe of white hairs each side of median stripe bordered by a dark gray stripe, the median dark stripe on the posterior half is the most conspicuous marking on the abdomen; sternum light with a cloudy gray center; venter almost covered by a sharply defined black spot, near the middle of which, three pairs of white muscle spots are distinctly seen, black before the epigastric fold; legs light yellow without marks, but I metatarsus and tarsus much darker; spines, I tibia, 2-2-2, 1 lateral which appears almost as ventral, metatarsus 2-2, 1 median apical; eyes, anterior row straight by the upper margins, shorter than second eye row, a.m.e. larger than a.l.e. and separated by less than half a diameter, almost touching a.l.e., p.m.e. separated by more than half a diameter, p.l.e. separated by almost three diameters; palpus, patella and tibia of about equal length, tarsus little longer than tibia, palpal organ as figured.

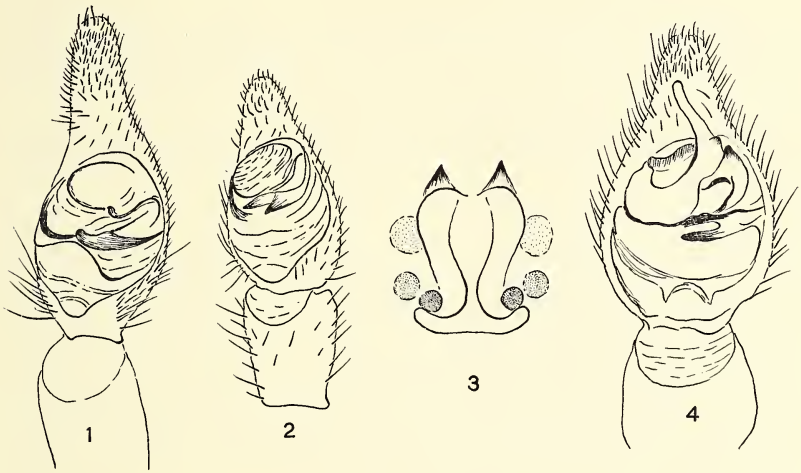
Holotype ♂ Florida, Big Pine Key, 20 December, 1933, A. F. Carr, coll.

This species has the narrow line of white hairs between the median eyes as in *Lycosa helluo*, but the light stripe is very much broader and the dark stripes narrower and the black spot on the venter is never found in the former species. It is named for the collector, Mr. A. F. Carr.

Arctosa incerta sp. nov. (Figs. 2 and 3.)

♂ 4. mm., ceph. 2. mm., abd. 2. mm.

Cephalothorax rather flat, reddish brown, sides veined with black, tegument glabrous with a very few black hairs,



FIGS. 1-4. 1, *Lycosa carrana* sp. nov., palpus; 2, *Arctosa incerta* sp. nov., palpus; 3, *Arctosa incerta* sp. nov., epigynum; 4, *Schizocosa floridana* sp. nov., palpus.

a bright yellow triangle with apex at dorsal groove gradually darkening towards eyes, eyes surrounded by black, a bright stripe from dorsal groove to posterior margin, a very narrow black marginal line; abdomen reddish brown sparsely covered with long black hairs, a pair of irregular black marks at base with bright yellow between, usual spear mark very faint, margined with black dots, many

small black spots closer together about middle, sides thickly covered with dark spots; sternum pale, darker about margin, venter heavily spotted with black; labium higher than wide; coxæ light; legs covered with black hairs, femora with three interrupted dark rings, tibiæ darker, spines, I spine on III or IV tibia above; eyes, anterior row shorter than second row, slightly procurved, equidistant, a.m.e. larger than a.l.e., p.m.e. less than diameter apart, quadrangle of posterior eyes almost square; palpus, femur longer than patella and tibia, patella and tibia about equal length, tarsus once and a half as long as tibia; palpal organ as figured.

♀ 4.1 mm. long, ceph. 2. mm., abd. 2.4 mm.

Markings the same as in male but brighter and the basal marks at base of abdomen not as large; spines and eyes the same as in male; epigynum with the usual median septum and terminal transverse piece as figured.

Holotype ♂ Florida; St. Petersburg, 8, April, 1933, H. K. Wallace, coll.

Allotype ♀ Florida.

The generic position of this species seems uncertain. Following the generic key given by F. O. P. Cambridge in the Biologia Centrali-Americana, it would be placed in the genu *Arctosa* because it lacks a spine at the base of the III and IV tibia. The male palpus is very similar, but it is very much smaller than others in the genus. The quadrangle of posterior eyes is almost square, a character usually found in *Pardosa,* but the cephalothorax is very low so it could not be placed in that genus and the palpus is very unlike that of other species. In all specimens seen the yellow spot in front of the dorsal groove is very conspicuous.

Schizocosa floridana sp. nov. (Fig. 4.)

♂ 4.5 mm. long, ceph. 2.4 mm., abd. 2.2 mm.

Cephalothorax with a wide median yellow stripe with irregular margins which extends beyond the third row of eyes, bordered by a dark brown stripe veined with black, a supramarginal light stripe, black about the eyes; abdomen with usual basal spear mark rather indistinct, followed by

dark chevrons, a pair of dark spots at base with a bright yellow area between, sides spotted; sternum yellow, venter spotted with black; legs yellow with three poorly defined dark rings on femora, I tibia and metatarsus darker, with few long hairs but no brush as in *Schizocosa ocreata;* eyes, anterior row straight, shorter than second row, a.m.e. larger, separated by half a diameter and almost touching a.l.e., p.m.e. separated by less than a diameter; quadrangle of posterior eyes slightly wider behind; clypeus black, as high as diameter of a.m.e., palpus patella and tibia of about equal length, tibia only slightly swollen, about as wide as long; palpal organ similar to *Schizocosa ocreata* but anterior horn longer and more slender, central tenaculum not bidentate.

Holotype ♂ Florida, Gainesville, 31, March, 1933. H. K. Wallace, coll. No. 134D.

This species differs from *Schizocosa ocreata* by the smaller size, lack of brush of hairs on the first tibia and the differences in the palpal organ.

GROWTH AND DETERMINATE SIZE IN INSECTS

By Charles T. Brues.

In common with nearly all metabolic activities, growth is essentially a determinate process, and size since it is the ultimate result or end product of growth, is inherently determinate also. To speak of the determinate size of an individual animal is therefore only to restate a self evident fact, and he who attempts to expound upon its truth may be accused of considerable naiveté. During the recent cycle of biological investigation much attention has been given to the phenomena of growth, especially by physiologists, geneticists and statistical biologists. These workers have defined in mathematical terms certain of the more evident features of growth both in individual organisms and in populations, but I believe that it remains for some one more deeply interested in another phase of biology, namely taxonomy, to consider size as in a sense a static phenomenon in spite of the fact that it is clearly a measure of growth. This is particularly appropriate in dealing with insects, since in them the growth process is ordinarily very rapid, ceasing abruptly and not gradually slowing down. Such observations are necessarily less precise than the data just mentioned, but they serve to demonstrate the existence of a deep-seated and stable genetic constitution which determines size and the growth process by which it is attained in individual animals. Size as we shall consider it, results from the interaction of a series of excitatory and inhibitory stimuli during the development of an individual whereby its growth follows quite closely a definite and predictable course, terminating when adult size is attained. Such termination is particularly definite in the case of insects where almost without exception the imaginal or reproductive stage marks sharply the attainment of final size and form.

This determinate and definitive size involves certain gross characteristics, irrespective of the multiplicity of factors which have produced it, that are patent to any student of taxonomy. Those to which I shall refer to-day relate to comparative imaginal size in insects, although, since absolute size is directly dependent upon rate and time of growth, these cannot be eliminated completely from any discussion of size.

We usually speak of insects as small animals, but there exist great variations in size in practically every extensive taxonomic group. We find that some beetles, for example, are in bulk several million times as large as other beetles, if we compare the largest Scarabæoidea with certain minute Ptiliidæ. Many less striking differences appear in other orders and I have been tempted to draw upon an admittedly scattered knowledge of insects in general to illustrate certain size peculiarities in various groups.

Insects are by no means an exception among extensive groups of animals by reason of their great variation in size, as very similar or greater diversity may be pointed out in other classes of animals, as the Crustacea, fishes or mammals, or in the Phylum Mollusca, if we compare certain minute gastropods with giant squids. In all animals size shows a marked correlation with taxonomic groupings, *i. e.*, size must be regarded as having an inherently stable genetic basis which is its primary determinant. Secondarily it is modified with reference to food or climate, but such modifications do not show any great constancy, regularity or extent. Thus in the tropics the size of certain types of insects is increased, for example, many scarabæoid beetles are represented there by species much larger than those in cooler regions, and the same is true in some other groups. On the other hand the reverse obtains among other types, although it must be admitted that tropical climates on the whole favor larger size in insects if we compare members of the same group and especially species in single families. Among marine invertebrates large size is very often associated with cold waters, but a reverse condition occurs in some groups. The largest living terrestrial mammals are tropical, yet in some families the species are decidedly larger in

cold climates. Among reptiles the largest forms are very clearly those of the tropics. Without multiplying examples further it is evident that neither warm nor cold climates can be regarded as constant stimuli to large size among animals in general. Thus certain types appear to wax larger in one to which they are usually said to be best adapted. The accuracy of such a conclusion is certainly open to question, as it is based on the dubious assumption that increased size is indicative of a more perfect adaptation to the environment.

I shall hope to be pardoned for introducing the foregoing long series of commonplace statements, but it appears necessary to have them in mind before going any further.

In general, the average size of insects has probably decreased during the history of the group on the earth, at least during its early history, but these changes have been very slight compared with the great increases in size that occurred, for example, very early in the history of the mammalia, in certain special groups of mammals, and among the mesozoic reptiles during their period of ascendency. Among these mammals and reptiles this great increase in size has consistently led to the extinction of the groups in which it occurred. Since some primitive types of living insects are of very small size, we may reasonably believe that such small forms were more abundant during the early history of insects than actual paleontological discoveries have yet been able to show. We know in some cases like that of the early giant dragon-flies that comparatively large size still persists as a general characteristic of recent Odonata. The same is true generally in other groups like the Blattariæ, Orthoptera, Mantodea and Corrodentia which tend to adhere rather closely to the size-range which prevailed among their ancient prototypes. Thus conservatism in size appears to be a characteristic of insect groups over long periods of time. The failure of any insects to attain a size comparable to that of certain giant Crustacea is usually attributed to their aërial habitat which renders their soft bodies highly susceptible to gravitational and traumatic deformation at the time of molting. This is certainly not the entire story, however, as there are no un-

usually large aquatic insects, and the body-shape of large insects is not that which would lessen gravitational stresses. We must certainly admit that there is some good reason, probably dependent in great part upon the insect's respiratory and circulatory systems, which acts still more strongly to keep its body-size below certain limits. However, as the vast majority of insects do not tend to approach these limits, such factors are obviously not important ones in regulating size as between minute, small or moderate-sized forms. We may expect to find correlations between the size of the egg or its contained embryo and the size of the imaginal insect, and it would be totally unexpected if definite correlations were not to be found. It is surprising to note, however, that such a correlation is by no means universal. Many rather large insects, like meloid beetles, produce a large number of small or minute eggs, and a survey of such cases reveals quite universally some type of development which exposes the early stages to great vicissitudes of life. On the other hand some small or minute insects produce comparatively very large eggs or young, such as certain phorid flies and aphids, and the pupiparous Diptera. There are also very striking examples to be found among the parasitic tachinid flies where closely similar forms produce either many small, or a few large eggs, respectively, irrespective of the size of the parent flies. In all such cases differences in size at birth are not correlated with imaginal size, and represent highly adaptive modifications with reference to post-embryonic growth which have not in the least affected imaginal size.

Since the primary requirement for growth is food we may expect to find size in insects dependent at least to some degree upon abundance or type of food. Vegetarian diet furnishes a much more constant and plentiful source of food materials than that available for forms that depend upon animal foods, but larger amounts are necessary to supply equal energy. It is very evident in groups where both types of food habits occur that the vegetarian forms are more numerous in individuals, but do not develop to greater size. This is well illustrated by the very populous colonies of those ants which subsist on plant food in comparison with

carnivorous species where the colony is consistently smaller. Here individual size does not respond to abundant food supply, but instead an increase in the number of individuals or in the size of the colony occurs. This condition appears to be repeated very generally in other, non-social, groups of insects, although increase in numbers is not so patent in the case of non-gregarious species. It must be said, however, that the bulkiest of all insects like the goliath beetles, hercules beetles, certain phasmids, saltatorial Orthoptera, giant silk-worms and the like are vegetarian, although the dragon-flies, tarantula-killer wasps and mantids of carniverous habits attain exceptionally large size. Also, the largest insects which, so far as we know, ever existed were predatory dragon-flies. It may be said as a rule that the smallest insects as well are vegetarian, saprophagous or microphagous although there are many minute entomophagous parasites. Predatory or carnivorous forms are neither abundantly represented among the smallest forms of insect life, nor are they conspicuously numerous among the largest.

Abnormalities in size among certain individuals may occur through a gross insufficiency of food during growth. Certain of the larger muscoid flies that develop in fermenting or decaying materials may vary considerably in size, frequently producing some greatly dwarfed individuals where their food supply has failed before larval growth was completed. Such specimens develop completely except for size. The partly grown larvæ of certain dermestid beetles may even decrease in size when starved and again grow to produce normally sized individuals when food is restored. Such abnormalities do not of course apply to our present discussion.

Certainly no generalizations concerning size in insects can be derived from the conflicting mass of details which present themselves when we attempt to correlate size with any of the foregoing trophic, developmental or environmental differences. Nevertheless, the size range in a great many taxonomic groups is very restricted; in others size varies widely, and occasionally giant forms appear singly or sporadically in groups otherwise very homogeneous in

respect to size. Speaking in very general terms, several orders of insects include consistently small or minute species, for example the Protura, Collembola, Thysanoptera, Zoraptera, Mallophaga, Anoplura, Siphonaptera, Strepsiptera and Corrodentia, the last group being less appropriately cited as it includes a few moderate-sized species. Other orders include entirely or in great part large species, such as the Phasmatodea, Mantodea, Orthoptera, Blattariæ, Odonata and Megaloptera. It is noticeable in the latter series that small forms do occur here and there in practically all of the orders cited as there are a few very small Blattariæ and Orthoptera; moreover some Mantodea and Odonata are by no means large insects. In some orders size is extremely variable, for example in the Hemiptera, Neuroptera, Trichoptera, Lepidoptera, Diptera, Hymenoptera and Coleoptera. By far the majority of insects are included in these seven orders of which the last four are far and away the most extensive.

Several matters relating to size stand out very clearly from the rough approximations just outlined. Extensive groups composed of large species produce occasionally or sporadically small or dwarf types. Thus it appears that a reduction in size has been accomplished far more easily during the course of evolution in insects than has the reverse change whereby small types have given rise to large ones. The most extensive orders where speciation has been most active and where the appearance of diverse types has proceeded at a rapid rate, exhibit the widest range in size. It follows therefore that size and form show a strong tendency to remain constant or to vary together, not to be modified independently of one another. This is strong evidence that size has a strongly fixed genetic basis since it does not readily change, except in groups where morphological diversification and adaptation has been most extensive.

Even in these orders the fixity of size is well illustrated if we compare the subdivisions such as superfamilies or families. Among the Hymenoptera, for example, certain superfamilies show great constancy in size. The superfamilies Serphoidea, Chalcidoidea, and Cynipoidea include only small or minute species, with really only a single com-

paratively "giant" generic type (Pelecinus, Leptofœnus and Ibalia, respectively) in each superfamily. This is true notwithstanding the fact that certain of the minute parasitic forms have developed the most unexpected method of development, known as germinogony, whereby a single egg produces enough larvæ to consume a large caterpillar. Here numbers replace size in exploiting the trophic field. On the other hand in the same order Hymenoptera other superfamilies do not show such constant size. The Tenthredinoidea, Ichneumonoidea, Vespoidea and Formicoidea include moderate-sized species with numerous small and scattered large types, showing that a wide variation in size in this extensive order is characteristic only of certain groups. The largest known Hymenoptera are Jurassic Siricoidea, a superfamily whose living representatives are still characteristically large insects with a few small, derived types.

Another very extensive order, the Lepidoptera, show more or less similar conditions with reference to size. This group was at one time rather crudely divided into "Microlepidoptera" and "Macrolepidoptera." The former group is really composed almost entirely of one superfamily, the Tineoidea with a slight admixture of more primitive forms (Micropterygoidea) that are really quite closely similar to certain much larger ones (Hepialoidea) near which they are now placed. The more rational taxonomic grouping of these primitive types into two superfamilies corresponds closely to the size of the included types.

With these facts in mind we must discard at once any supposition that relates body size in insects to fortuitous circumstances or to adaptations readily acquired in relation to a changing or specialized type of environment. Size appears as a highly stable character, deeply imbedded in the genetic constitution of at least most groups of insects.

OBITUARY

ARGYLE B. PROPER, an associate member of the American Association of Economic Entomologists, died at his home in Wakefield, Mass., on December 16, 1933, after being ill about a week with pneumonia. Mr. Proper was born in Sunapee, N. H., on March 4, 1905. He received a B. S. degree from the University of New Hampshire in 1926 and a M. S. degree from the same institution the following year, having majored in entomology. On July 1, 1927, he was appointed a Junior Entomologist in the U. S. Bureau of Entomology for work at the Bureau's laboratory at Melrose Highlands, Mass., with which station he was connected up to the time of his death.

Although Mr. Proper had published but one entomological article, another manuscript had been accepted for publication, and he was to have presented a paper at the Boston, Mass., 1933, meeting of the Entomological Society of America. At the time of his death he was preparing two other manuscripts. These and the papers he had completed had to do directly or indirectly with forest and shade tree insects. Collecting insects in the White Mountains interested him and he spent much of his vacation time on hiking trips in that region.

Mr. Proper was a member of the Cambridge Entomological Club, at the meetings of which he was a regular attendant.

T. H. JONES.

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THE ORIGIN OF THE PERITROPHIC MEMBRANE IN SCIARA AND THE HONEY BEE

By F. H. Butt
Cornell University.

Many explanations have been given for the origin of the peritrophic membrane. Some authors maintain that it is formed from secretions of the epithelial cells of the mid-intestine and is non-chitinous in structure. Others think it is a continuation of the chitinous intima lining the œsophagus and is secreted by cells lying at the junction of the fore and mid-intestine. No investigation has been made of its origin in the embryo.*

Recently while making an embryological study of Sciara I was interested in the extreme length attained by the stomodæal membrane in the later stages. It so resembled the peritrophic membrane of the larva both in its position and in its point of attachment that a relationship between the two was immediately evident. Therefore a number of newly emerged larvæ were killed and sections were made to see if a peritrophic membrane were present in the very first stage, and if so, whether it had any resemblance to the stomodæal membrane in the embryo. The larvæ were fixed in Carnoy-LeBrun fluid for thirty seconds and were embedded in rubber-paraffin. The sections were cut at four microns, were stained in magenta and counter-stained in picro-acid-carmine.

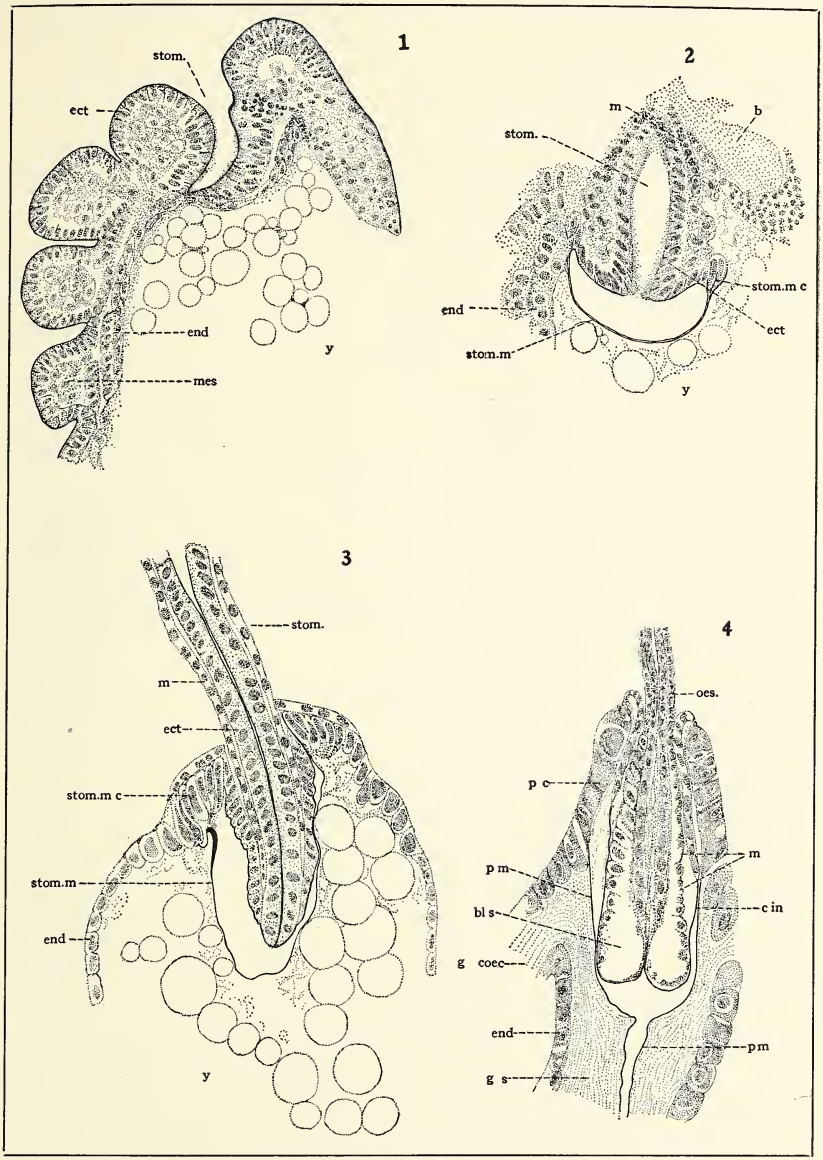
*Since this paper was submitted for publication, a paper by Gambrell has appeared (Ann. Ent. Soc. Am. Vol. XXVI:641) mentioning the origin of the peritrophic membrane in Simulium.

In the embryo, the stomodæum begins as a shallow depression in the ectoderm at the anterior end shortly after the thirtieth hour, coincident with the beginning of segmentation. As it deepens, it forms a tube closed at its inner end by ectodermal cells (fig. 1). These cells become thinner as the end of the tube widens until at the sixty-fifth hour the tube is closed at its inner end by a thin membrane in which no nuclei are present. Between the sixty-fifth and the seventieth hours the end of the stomodæum flattens and spreads out. At the same time the stomodæal membrane increases in size and hangs loosely in the yolk. The stomodæum now resembles an inverted hollow mushroom, the membrane forming the outline of the cap (fig. 2). As the stomodæum continues to grow, the flattened end folds back on itself so that the mesodermal layer (m) surrounding the stomodæum lies between two layers of ectoderm (fig. 3).

The stomodæal membrane hangs loosely in the yolk and steadily increases in size, not as the result of cell proliferation but apparently by secretions from differentiated cells located on the end of the recurved stomodæum where it joins the mid-intestine (fig. 2, stom m c). These cells are elongated, with their extremities drawn out very thin where the substance of the stomodæal membrane is given off. At the eightieth hour only a few secretory cells are to be seen. They increase in size and in number between the eightieth and ninetieth hours until they form a very conspicuous mass around the stomodæum (fig. 3). In the meantime the membrane (stom m) has lengthened. The muscular wall of the fore-intestine, lying between the two layers of ectoderm of the stomodæum, is still thin. Figure three represents the stomodæum at ninety hours, shortly before the larva emerges from the egg. The walls of the mid-intestine at this time are complete.

Between the ninetieth hour in the egg, and the time the hatched larva is ready to feed, the appearance of the stomodæum changes considerably (fig. 4). The sack-like stomodæal membrane becomes the tube-shaped peritrophic mem-

Psyche, 1934 Vol. 41, Plate 4



Butt—Peritrophic Membrane in Sciara

brane probably when the first food breaks through the sack on its passage down the intestine. The muscular wall (m) of the œsophagus (oes) that was a simple layer of cells at the ninetieth hour (fig. 3), expands into a bulb-like ring at the end of the œsophageal valve. Inside this ring is an open space which Wigglesworth (30) calls a blood sinus (bl s). This muscle with its blood sinus is a sphincter which, when expanded, closes off the mid-intestine to the entrance of food. When contracted, the passageway through the œsophageal valve is open. The ectodermal cells, lining the stomodæum, that were so large in the embryo, have thinned out and disappeared over the end of the bulbous ring, their place being taken by a thin membrane, the chitinous intima (c in). The cells secreting the peritrophic membrane (p c) which have now assumed a very regular appearance with smooth inner and outer walls, are very large and vacuolated. At the sides of the mid-intestine lie the two gastric cœca (coec) which discharge their contents into the intestine near the œsophageal valve. Their contents are prevented from bathing the œsophageal valve by the peritrophic membrane (m) which is forced together by the fluid and extends down into the mid-gut.

Nelson ('15) states that the stomodæum in the honey-bee is closed at its inner end by cells of the anterior mesenteron rudiment. He does not mention any embryonic origin for the peritrophic membrane. Snodgrass ('25) refers to Nelson in regard to the stomodæal membrane and says, "the old idea that the peritrophic membrane of insects is a backward prolongation of the chitinous intima of the proventriculus has been discredited in all recent investigations on its origin." He finds that it is formed in the adult bee from protoplasmic bodies given off from the epithelial cells of the mid-intestine. These fill in the granular layer. Wigglesworth ('30) is of the opinion that the peritrophic membrane is of two-fold origin: a chitinous basis, secreted at the anterior end of the mid-gut and a series of indefinite membranes which condense on the outside of this as it proceeds down the gut. Having access to some slides of the

honey-bee embryo, I was interested to see if there were any possible embryonic fore-runners of the peritrophic membrane.

An examination of the slides indicated that the stomodæal invagination forms in the same manner as in Sciara. The cells in the floor of the invagination are a continuation of the ectoderm which forms the walls of the tube. The tube lengthens and widens at the end, the floor being reduced to a thin membrane similar to that described above for Sciara. Late in the embryonic stage the inner walls of the stomodæum protrude into the mid-intestine rupturing the membrane. Around this invaginating tube lies a thickened ring of cells that resembles the ring of cells secreting the stomodæal membrane in Sciara. It also corresponds to the basal folds of the mid-gut as figured by Wigglesworth ('30) from which, he says, originates part of the peritrophic membrane. Campbell ('29) has demonstrated the presence of chitin in the peritrophic membrane which is further proof that it arises from the ectoderm. A study of the first stage larva would undoubtedly yield more evidence but no larvæ were available at the time this study was being made.

Summary

An examination of the œsophageal valve in both the embryological and the early larval stages of Sciara indicates that the peritrophic membrane is a continuation of the stomodæal membrane and is ectodermal in origin. It arises from a group of large secretory cells lying around the œsophageal valve and attached to the upper edge of the mid-intestine. These cells which are also ectodermal in origin, begin their development from the end of the stomodæum as it widens out and reverses its direction of growth. The large bulbous muscular layer of the œsophagus which encloses the blood sinus, develops from the single layer of mesoderm which surrounds the stomodæum.

In the honey-bee the formation of the stomodæum resembles the development in Sciara except that the stomodæal membrane does not attain such a great length but is

broken when the inner end of the stomodæum pushes through. The peritrophic membrane, as described by Wigglesworth, is chitinous and arises from a mass of cells corresponding in position to the base of the stomodæum in the embryo. This indicates that the peritrophic membrane is ectodermal in origin.

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A NEW AMERICAN MYRMOSID (HYMENOPTERA: MYRMOSIDÆ)

By Neal A. Weber
Harvard University.

The following new species in a small genus of Scoloioid wasps allied to the Mutillidæ is here described in order to use the name in a revision, now in progress, of the ant genus *Myrmica* Latreille. My thanks are due Professor C. T. Brues and Mr. Richard Dow of Harvard University for their opinions concerning its taxonomic status.

Myrmosa dakotensis n. sp.

Female: Length 3.6 mm.

Color of head blackish brown with a mahogany red transverse band across the base of the mandibles and extending to a level with about the anterior ¼ of the eyes; of thorax mahogany red with a blackish brown anterior margin on the second segment, extending over the dorsal surface and down to about the middle of the sides, pronotum paler than the second segment; of first abdominal segment and margins of second, mahogany red, other sutures and pygidium duller brown; of appendages mahogany red, heavily infuscated on the apical antennal segments and on the dorsal surfaces of the femora and tibiæ.

Hairs moderately abundant, mostly subappressed and short, except on the abdomen, where longer; joints of flagellum densely and finely pubescent, sparsely and inconspicuously so elsewhere. Posterior metatarsi with long and distinct spines.

Surface of body shining; head densely and coarsely, abdomen less densely and more finely, punctate; dorsal surface of thorax sharply and irregularly vermiculate, irregularly and sharply tuberculate on the propodeum; sides of prono-

tum striate in a dorso-posterior direction, sides of second segment smooth; propodeum, in dorsal aspect, smooth but for sparse and minute setigerous punctation; first abdominal segment with two sharp, transverse, sinuate carinæ dorso-anteriorly, posteriorly with small tubercles, declivous surface largely smooth, with scattered setigerous punctation; pygidium microscopically punctulate, dull.

Head, in front view, evenly convex posteriorly, a distinct gibbosity in front of the eyes; face with a prominent black spine between the antennæ; ocelli slightly less than 0.04 mm. in diameter, posterior pair 0.22 mm. from each other and 0.31 mm. from the eyes; first segment of the flagellum about as broad as long, equal to the pedicel and shorter than the second. Thorax, in dorsal view, with parallel sides; in lateral view, with a distinct notch between the pronotum and the second segment, humeral angles of the pronotum rounded obliquely, posterior margins forming a rounded right angle, second segment broadly depressed; median ventral gibbosity on the propodeum faint.

Holotype: One female taken by myself at Towner, North Dakota, June 27, 1933.

This species differs distinctly from paratypes of *M.* (*Myrmosa*) *banksi* Bradley[1] in the Museum of Comparative Zoölogy in color, smaller size, larger ocelli and their disposition, less distinct propodeal gibbosity, sculpturing and in other characters. It is much smaller than *M. thoracica* Blake, which is associated by Bradley and Melander with *M.* (*Myrmosa*) *unicolor* Say, and differs also in color, sculpturing and shape. From the description of *M.* (*Myrmosa*) *blakei* Bradley it differs in smaller size, color, in the shape of humeral angles, smaller ocelli and their disposition and in the presence of distinct posterior metathoracic spines and of dorsal carinæ on the basal abdominal segment.

[1]Bradley, J. C. — Contributions towards a Monograph of the Mutillidae and their Allies of America North of Mexico. IV. A Review of the Myrmosidae. Trans. Amer. Ent. Soc., No. 764, 1917.

This wasp crawled up on my hand as I was digging up a colony of the ant, *Myrmica scabrinodis lobicornis* var. *fracticornis* Emery. The colony was in moist loam under grass roots in a partly shaded situation. The larvæ of the ants were disposed in several chambers scattered through the upper few inches of the soil. It seems possible that this species of *Myrmosa* parasitizes *Myrmica* and other ants.

AN AUSTRALIAN ANT OF THE GENUS LEPTOTHORAX MAYR

By William Morton Wheeler

Leptothorax is supposed to have a cosmopolitan distribution, if we except Australia, Papua and New Zealand, from which no species of this large genus has ever been described. A few species range well up into the north temperate zone, both in North America and Eurasia, while others occur as far south as southern Brazil, the Cape of Good Hope and Sumatra. Several subgenera have been recognized but one is inclined to agree with Emery that the characters on which they are based are rather illusive and unimportant. Furthermore, Leptothorax is not sharply differentiated in tropical America from the genus Macromischa Roger.

It now appears that Leptothorax is represented in the Australian fauna by at least one species. The late Mr. A. M. Lea of Adelaide, South Australia, sent me many years ago a large, miscellaneous collection of ants which he made in various parts of the island continent. Among the specimens, two workers which he took in the Cairns District, Queensland, unquestionably belong to the genus Leptothorax and combine the elongate petiolar peduncle of a group of species (*rottenbergi* group of Emery), peculiar to the Mediterranean Region, with the epaulate pronotum of the subgenus Goniothorax, to which Emery has assigned the Ethiopian, South African, Malagasy, Sumatran and Neotropical species. Since, however, a similar combination of characters occurs in at least one South African Leptothorax (*L.* (*G.*) *latinodis* Mayr) I am placing the Australian ant in the subgenus Goniothorax.

Leptothorax (Goniothorax) australis sp. nov.

Worker: Length about 2.7 mm.

Head somewhat longer than broad, broader behind than in front, with short, faintly sinuate posterior border, very

broadly rounded posterior corners and nearly straight, anteriorly converging sides. Eyes rather large and convex, situated slightly in front of the middle of the head. Mandibles stout, with convex external borders, the masticatory borders with three terminal teeth but with the basal half straight and indistinctly crenulate. Clypeus convex, its anterior border broadly rounded and entire in the middle, sinuate on each side. Frontal carinæ thin, rounded, scarcely diverging behind; frontal area distinct, impressed, elongate; frontal groove absent. Antennæ stout, 12-jointed; scapes strongly curved at the base, their tips reaching to slightly more than two-thirds the distance between their insertions and the posterior border of the head; first funicular joint as long as joints 2 and 3 together, 2 nearly as long as broad, 3-8 decidedly broader than long, remaining joints forming a very distinct 3-jointed club, the combined two subequal basal joints of which are shorter than the terminal. Thorax in profile with broadly arcuate dorsal outline, but slightly and indistinctly impressed at the mesoëpinotal suture, broadest through the pronotum; neck large, anterior border of pronotum arcuate, its anterior angles distinct but neither acute nor dentate, its sides straight, parallel and marginate anteriorly, straight and converging posteriorly; promesonotal suture obsolete; mesonotum short, nearly twice as broad as long, with subangulate sides and somewhat flattened dorsal surface; epinotum longer than broad, subrectangular, slightly narrower than the mesonotum, its base from above subhexagonal, with very prominent spiracles, the spines stout and blunt, as long as their distance apart at the base, directed backward and slightly upward and curved inward; the declivity in profile shorter than the base, straight and abrupt above, concave below. Petiole more than twice as long as broad, its peduncle long and stout, as long as the node, with prominent spiracles anteriorly and a sharp anteroventral tooth; the node from above somewhat broader than long, subrectangular, with evenly rounded sides; in profile with concave anterior, straight and horizontal superior and short and convex posterior surface. Post-

petiole distinctly broader than the petiolar node, rounded-trapezoidal, about one and three-fourths times as broad as long, broader in front than behind, with broadly arcuate anterior border, distinct but blunt anterior angles and straight, rather strongly posteriorly converging sides. Gaster elliptical, with excised anterior border. Femora and tibiæ distinctly incrassated.

Shining, the head, thorax and pedicel less so than the gaster and legs; mandibles very finely punctulate or shagreened, with sparser, indistinct, elongate punctures. Clypeus, head and thorax coarsely and reticulately rugose, the rugæ more longitudinal on the clypeus, front, thoracic dorsum and pleuræ; the interrugal spaces shining and irregularly reticulate; epinotum, petiole and postpetiole finely and regularly reticulate or densely punctate, the petiolar node also irregularly longitudinally rugose, but less sharply than the head and thorax. Gaster and legs smooth and shining, with sparse piligerous punctures; antennal scapes finely punctulate.

Hairs pale yellowish; those on the head, antennal scapes, thorax and abdomen rather abundant, regularly arranged, erect and clavate; those on the legs short, sparse, pointed and appressed.

Brown; head posteriorly and gaster, except anteriorly and posteriorly, darker, castaneous; mandibles, clypeus, bases and borders of posterior gastric segments, antennæ and legs, including the coxæ, brownish yellow or yellowish brown.

Two specimens taken by A. M. Lea in the Cairns District, Queensland.

A NEW STRUMIGENYS FROM ILLINOIS (HYMENOPTERA: FORMICIDÆ)

By Neal A. Weber
Harvard University

The ant here described was obtained through Dr. M. R. Smith from the Illinois Natural History Survey. It proves to be the sixteenth Nearctic species of a small and inconspongiform processes on the pedicel and, in many forms, by development in the tropics. The members of this genus are found chiefly in rotted wood on the ground or in damp soil under stones and are comparatively rare and little-known. They are noteworthy in the possession of six-jointed antennæ, peculiar and diverse pilosity, strange spongiform processes on the pedicel and, in many forms, by a great development of the mandibles.

Strumigenys (Cephaloxys) talpa n. sp. (Fig. 1)

Worker: Length 1.8 mm.

Head 0.56 mm. long, cordate, shallowly excised at the posterior margin, occipital margins rounded, sides anterior to the antennal insertions converging gently to the mandibles; clypeus with evenly rounded anterior margin and posterior angle obtuse; exposed part of mandibles less than $\frac{1}{5}$ the length of the remainder of the head, outer margins convex, inner margins armed at the apical $\frac{2}{3}$ with about 6 acute teeth and at the apex with several smaller acute teeth, armed at the base with a single large acute tooth; antennal scapes extending posteriorly to the maximum breadth of the head, evenly bent inwards at the base; 1st joint of the funiculus distinctly longer than the 2nd and 3rd together and about equal in length to the 4th alone, terminal joint distinctly longer than the preceding joints of the funiculus together. Thorax, in profile, evenly convex, mesoëpinotal suture faintly indicated; epinotal spines acute, low, directed backwards and slightly upwards; infraspinal lam-

inæ low but distinct. Petiole, in profile, with a distinct peduncle which narrows anteriorly; node rising suddenly but evenly and with evenly convex dorsal surface; postpetiole subglobular. Gaster ovate with acutely pointed apex. Legs moderately long and slender.

Surface of the head and thorax irregularly reticulate, subopaque; gaster smooth and shining except for the coarsely striate basal ⅓-½.

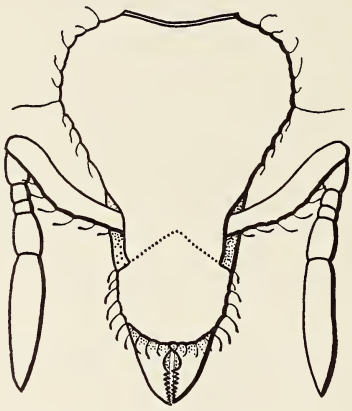


Fig. 1. *Strumigenys* (*Cephaloxys*) *talpa,* n. sp., head of worker in anterior view.

Hairs of the dorsal surface of the head moderately long, abundant, reflexed; with several long, fine and erect hairs projecting from the postero-lateral margins of the head; hairs of clypeus numerous, narrow-squamose; hairs of mandibles short and subappressed; about 6 moderately long hairs fringing the anterior margin of the scape and bent distally. Hairs of thorax long, fine, suberect or reclining. Hairs of legs long, fine, appressed and abundant. Antennal and tarsal joints with appressed pubescence. Gaster with a few long straggling hairs becoming more numerous and shorter distally. Spongiform bodies well developed, covering the anterior end of the gaster, all the postpetiole except the dorsal surface and the posterior dorsal half of the petiole.

Color ferruginous; appendages somewhat lighter; gaster with a brown band across the middle.

Holotype: One worker taken by T. H. Frison and H. H. Ross at Herod, Illinois, October 12, 1933. To be deposited in the collection of the Illinois Natural History Survey.

This species runs to *S. clypeata* Roger in Dr. M. R. Smith's key.[1] From two cotypes of *clypeata* in Dr. W. M. Wheeler's collection, however, it differs in a number of distinct characters. The open area at the base of the inner margins of the mandibles is larger and more distinct; the fourth joint of the funiculus is not distinctly longer than the first; the peduncle of the petiole is not cylindrical as in *clypeata;* the pilosity of the head is less abundant, especially on the clypeus where the hairs are narrow-squamose (the hairs on the clypeus and along the antennal scape of *clypeata* are clavate in the two cotypes). From three cotypes of *S. pulchella* Roger it differs in more converging anterior margins of the head, larger mandibles, shape of the pedicel and in pilosity.

[1]Smith, M. R., A Revision of the Genus *Strumigenys* of America, North of Mexico, Based on a study of the Workers, Ann. Ent. Soc. Amer., 1931, 24, 685-710, 4 pl.

NEW WEST INDIAN CARABIDÆ, WITH A LIST OF THE CUBAN SPECIES[1] [2]

By P. J. Darlington, Jr.

Museum of Comparative Zoölogy, Cambridge, Mass.

The purpose of the present paper is two-fold: first, to describe a number of new Carabidæ which have come to hand during several years of sporadic work on the West Indian fauna, and second, to give a complete list of the species now known from Cuba. Eventually I plan to publish a revision of all the Carabidæ of the West Indies. However, this will have to await the acquisition of much more material than is now available, and I think in the meantime a Cuban list (which adds very little to the length of this paper) will be useful not only to collectors on the island, but to any coleopterists in the United States who feel a responsibility for knowing something about the Cuban fauna.

The order of genera in the list is approximately that of the *Junk Catalogue*. The Cuban species are numbered consecutively; species from other islands are interpolated without numbers. Of the 134 species here listed from Cuba (about twice the number previously known) I have seen Cuban specimens of 128. The 6 which I have not seen are noted in the list. The synonymy which I have cited is practically limited to names used for actual Cuban specimens by earlier writers, of whom the chief have been the following:

1. Jacquelin-Duval, 1857, in Ramon de la Sagra's Histoire physique, politique et naturelle de l'Ile de Cuba (French Ed.), Animaux Articulés [Vol. 7], pp. 6-24 (Carabidæ).

[1]Publication aided by a grant from the Museum of Comparative Zoology.

[2]Including as a supplement a new Masoreus (Aephnidius) by A. J. Mutchler.

2. Chevrolat, 1863, Ann. Soc. Ent. France (4) 3, pp. 186-199.
3. Gundlach, 1891, Contribución á la Entomologia Cubana, Vol. 3, part 5, pp. 12-33 (sometimes cited as of An. Acad. Cien. Habana).
4. Leng & Mutchler, 1914, Bull. American Mus. Nat. Hist. 33, pp. 393-397.
5. Leng & Mutchler, 1917, Ibid. 37, pp. 194-195.

The material I have examined includes the collections of the Museum of Comparative Zoölogy (containing Cuban specimens collected by me in 1926 and 1929, on trips made possible by grants from the Atkins Foundation of Harvard University), the United States National Museum, the American Museum of Natural History, and the Philadelphia Academy of Sciences (Poey material from Cuba); collections submitted by Prof. Stuart T. Danforth (Puerto Rico), Mr. S. C. Bruner of the Estación Experimental Agronómica and Mr. M. L. Jaume (Cuba); and smaller lots of specimens from other sources. My thanks are due to all of these persons and to the curators of the museums mentioned. I have also to acknowledge assistance given me by Mr. René Oberthür, Mr. K. G. Blair, Dr. R. Jeannel, Dr. Joseph Bequært, Mr. A. d'Orchymont, Mr. W. S. Blatchley, Mr. A. J. Mutchler, Mr. M. Bänninger, Dr. S. Breuning, and the late Prof. H. F. Wickham, all of whom have either compared specimens with types inaccessible to me, or identified material in special genera, or helped me in other ways.

1. **Calosoma (s. s.) splendidum** Dej.
2. **Calosoma (Callistriga) a. alternans** (Fab.)
3. **Pachyteles gyllenhali** (Dej.)
   pallida (Chev.)
4. **Scarites alternans** Chd.
5. **Scarites subterraneus** Fab. (varities)
6. **Clivina dentipes** Dej.
   Clivina addita n. sp.

Of average form for Clivina of *dentipes* group, slightly depressed; black, appendages piceous. Head with clypeus

bi-emarginate each side, but less deeply so than in *dentipes;* front with longitudinal and transverse lines as in *dentipes,* with small median puncture, otherwise impunctate; antennæ not reaching to basal angles of prothorax. Prothorax by measurement very slightly wider than long; moderately convex; posterior margin basal; posterior angles not conspicuous; disk not punctate, with usual impressed lines and also with fine, irregular, well separated transverse lines. Elytra not margined at base, rather deeply striate, striæ moderately punctate; eighth stria not continued above humerus; third stria five-punctate. Front femur with small, rounded-obtuse tooth on lower posterior edge near apex; front tibia tridentate externally above terminal digit, finely bicanaliculate on anterior face near apex, inconspicuously toothed near middle of posterior face; front trochanters not angulately prominent; middle tibia spurred externally near apex; paronychium short or absent in unique type, but probably long in fresh specimens. Lower surface without unusual punctuation; last ventral with inner pair of punctures twice as far apart as distance between them and outer punctures. Length 8 mm.

Holotype (Museum of Comparative Zoölogy no. 19489) from Mayagüez, Puerto Rico, F. Mara, sent by S. T. Danforth; unique.

In Putzeys' revision of Clivina (Ann. Soc. Ent. Belgique 10, 1866) this species would belong in group 24 (*dentipes* etc.), but it will not fit in any of the six sections of that group. It is excluded from the first four sections either by absence of a basal elytral margin or by the small obtuse femoral tooth; from the fifth, by the impunctate abdomen and only slightly and broadly emarginate epistoma; and from the sixth, by the short antennæ. It is at once separable from *dentipes,* which it somewhat resembles, by the reduced femoral tooth.

7. **Clivina cubæ** n. sp.

Slender, parallel, slightly depressed; piceous black, appendages and parts of lower surface rufescent. Head with clypeus deeply bi-emarginate each side; front shining, al-

most impunctate except for a punctiform impression at middle; antennæ reaching about to basal angles of prothorax. Prothorax depressed, almost square, not narrowed in front; anterior angles minutely prominent, posterior angles finely denticulate; impressed lines on disk normal for *dentipes* group; surface of pronotum very finely punctate. Elytra with striæ moderately impressed and punctate; not margined at base between first and sixth intervals; small tubercle at base of first stria; third stria with five setigerous punctures; sixth and seventh intervals finely carinate at base, sixth joining elytral margin in front of humeral angle. Front femur with a short, obtuse tooth (hardly more than a pronounced sinuation) below near apex; front tibia lightly sulcate above, tridentate externally above terminal digit, with only a very minute tooth near middle of posterior face; front trochanters not angulately prominent; middle tibia with spur on outer side near apex; paronychium about as long as claws. Pro,-, meso-, and metathorax punctate at sides below; abdomen finely but distinctly punctate, especially at sides and on apical segment; prosternum about as in *dentipes;* last ventral with inner pair of setæ separated by about one and a half times the distance between them and outer setæ. Length 5½-6 mm.; width ± 1½ mm.

Holotype (Museum of Comparative Zoölogy no. 19490) and 10 paratypes from Soledad (near Cienfuegos) Cuba, June and Oct. 31, washed from gravel banks of the Arimao River; 6 paratypes from Cayamas,[1] Cuba, May 25-June 8, E. A. Schwarz (United States National Museum) ; 1 paratype from Baraguá, Camagüey, Cuba, June 5, L. D. Christenson, at light (U. S. N. M.).

This species belongs in group 24 (*dentipes* group) in Putzeys' revision (*l. c.*). Within this group it falls in section 5 or 6, resembling only *C. latimana* Putz. and *C. punctiventris* Putz., both of South America, in ventral punctuation. From *latimana, cubæ* differs in having the epistoma

[1]The Cayamas from which Schwarz's specimens came is in southwestern Santa Clara, near Yaguaramas (*Cf.* Proc. Ent. Soc. Washington 5, 1903, p. 287).

not more emarginate than usual at middle; from *punctiventris,* in having shorter antennæ. A comparison of specimens would probably show other differences. From *Clivina dentipes* and *C. addita,* the only previously described West Indian species of its group, *cubæ* is distinguished at once by its smaller size and more extensively punctate lower surface.

8. **Clivina limbipennis** J.-Duval
   simplex Chev.
9. **Clivina insularis** (J.-Duv.)
10. **Clivina bipustulata** (Fab.)
    bipustula (Chev.)
11. **Clivina biguttata** Putz.
    bisignata Chev. etc., not bisignata Putz.
12. **Dyschirius sublævis** Putz.
13. **Dyschirius erythrocerus** Lec.
14. **Oxydrepanus rufus** (Putz.)
    brevicarinatus (Putz.)
15. **Ardistomus nitidipennis** n. sp.

Of average form for Ardistomus; black, not bronzed, very shining; appendages and a pair of large, rounded, scarcely oblique subapical spots rufous. Head with clypeus almost evenly truncate; vertex not impressed. Prothorax almost orbicular; lateral margins reaching base; disk with usual impressions. Elytra very shining, not at all alutaceous; striæ moderately impressed, impunctate, entire, second reaching nearly to base; third interval five-punctate on outer edge (constant in all specimens). Last ventral with two punctures each side near apex. Front tibia bidentate externally above apical digit; front tarsi rather widely dilated. Length 5½-6½ mm.

Holotype (Museum of Comparative Zoölogy no. 19491) and 12 paratypes from Soledad (near Cienfuegos) Cuba, June, Oct. 21, Nov. 7 & 9; some taken in debris after heavy floods, others secured by treading down vegetation on the edge of a tiny brook in woods.

This is the first red spotted Ardistomus known from the West Indies. It belongs in group 1, section 1 of Putzeys' revision (Ann. Soc. Ent. Belgique 10, 1866, 200-). It is close to *A. convexa* Putz., of which we have a broken specimen from Mexico, but differs in being slightly less convex and in having the elytra shining, not alutaceous as in *convexa*. The Cuban species is also brighter, with larger elytral spots. From *A. obliquata* Putz. of the eastern United States, including Florida, the Cuban species differs in being smaller, with different outline of prothorax, and with fewer setigerous punctures on the third elytral interval.

16. **Ardistomus elongatulus** Putz.

17. **Ardistomus cyaneolimbatus** Chev.
gundlachi Putz. MS., Gundlach, etc.

18. **Aspidoglossa vulnerata** Putz.
comma Putz.

19. **Schizogenius arimao** n. sp.

Subparallel, slightly depressed; rufous (immature) or black, appendages and lower surface always more or less rufescent. Head with mentum toothed; vertex seven-sulcate, central carinæ nearly parallel, only slightly converging anteriorly. Prothorax by measurement slightly wider than long; disk impunctate, slightly wrinkled transversely, with a single longitudinal sulcus each side of the median sulcus. Elytra rather deeply striate, striæ punctate basally, not apically; third and fifth intervals each with about seven, seventh with about four setigerous punctures (exact number slightly variable). Front tibia as usual in genus. Male with three setigerous punctures placed triangularly each side of last ventral; female with two setæ each side, near margin. Length 3¾-4½ mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19492) and 24 paratypes from Soledad (near Cienfuegos) Cuba, June, Oct. 19, Dec. 1 & 3; all washed from low gravel banks of the Arimao River. One paratype from Cumanayagua, Santa Clara, Cuba, June 10, F. de Zayas (in Coll. Estación E. Agronómica, Cuba).

This is the first known West Indian Schizogenius. It is close to *S. tristriatus* Putz. of Mexico and Central America (several specimens examined) but is smaller and more convex than typical *tristriatus* (described as 5 mm. long) and much smaller than variety *longipennis* Putz. (described as larger than *tristriatus*). Bates, in "Biologia," gives the size of his specimens of *tristriatus* as from 1½ to 2¾ lines, which would include specimens as small as the Cuban ones. However, the identity of the various Central American forms referred to *tristriatus* seems to me very questionable, and since the Cuban form, if it really is *tristriatus* at all, is fairly constant and smaller than either of the described continental forms, it seems best to treat it as a distinct species at least temporarily. It can hardly prove to be less than a good subspecies. In Leconte's table of North American Schizogenius (Bull. Brooklyn Ent. Soc. 2, 1879, p. 34) *arimao* runs to *lineolatus* or *sallei,* but is smaller and more convex than either.

Key to West Indian Bembidiini

The following key will help to define the numerous new species of Bembidiini which are described in the following pages. It includes all previously known West Indian species except *Tachys picturatus* Putz. (possibly a member of the *vittiger* group) and *T. piceolus* Laf. (possibly near *corruscus*), which I have not been able to identify in the material I have seen. It also excludes the completely blind *Petrocharis eggersi* Ehlers of St. Thomas, which I do not know.

1. Outer apical angle of front tibia normal, rounded; size 2⅔-6 mm. ..... (Bembidion) 2

   Outer apical angle of front tibia obliquely truncate or truncato-emarginate; size 3 mm. or (usually) less 6

2. Dorsal elytral punctures practically on third stria; color plain dark rufous; length 4 mm. ..... *Bembidion jamaicense* n. sp.

   Dorsal elytral punctures near middle of third interval; elytra more or less variegated 3

3. Front of head not at all alutaceous; 2⅔-3⅓ mm. ..... *Bembidion darlingtoni* Mutchler.

   Front of head alutaceous; size larger 4

4. Elytral striæ apically deleted or only lightly impressed. *Bembidion viridicolle* (Laf.).

   Elytral striæ entire, about same depth throughout 5

5. Prothorax with sides broadly but slightly sinuate before basal angles; latter only slightly prominent ..... *Bembidion fastidiosum* (Laf.).

   Prothorax with sides strongly and conspicuously sinuate before basal angles; latter rather prominent ..... *Bembidion sparsum* Bates.

6. Two setæ over each eye, but anterior sometimes shorter than posterior 7

   One seta over each eye; head sunk in thorax nearly to eyes ..... (Micratopus) 27

7. Eyes moderate or large; antennæ sometimes moniliform, usually not 8

   Eyes much reduced, small or minute; antennæ moniliform ..... (Limnastis) 28

8. Antennæ moniliform, middle joints as wide as long 9

   Antennæ more slender 10

9. Side margins of thorax broad, channeled, translucent; color castaneous with base and apex of elytra pale; size under 2 mm. ..... *Tachys* (*Tachyta*) *flavicauda autumnalis* Bates.

   Side margins of prothorax narrower, not translucent; color dark piceous, elytra each with a subapical red spot; size ± 2½ mm. ..... *Tachys* (*Tachyta*) *hispaniolae* n. sp.

10. Elytra each with six coarsely punctate striæ beside the marginal series of punctures; size ±2-2½ mm. ..... *Pericompsus blandulus* Schaum.

    Elytra with not more than five coarsely punctate striæ beside marginal series, *or* striæ not coarsely punctate 11

11. Posterior dorsal puncture of elytron (on outer edge of third interval, as a rule) much in front of apical recurved stria; body very convex 12
Posterior dorsal puncture of elytron on or within hooked tip of apical recurved stria; body usually more depressed 13

12. Elytra each with five coarsely punctate striæ or rows of punctures; mentum bi-perforate .....
Tachys (subgenus?) *immaculatus* (Bates).
Elytra each with only one or two striæ, which are impunctate; mentum not perforated .....
Tachys (*Tachyura*) *xanthopus* Dej.

13. Posterior elytral puncture directly upon hooked tip of apical recurved stria; surface not iridescent 14
Posterior elytral puncture within, not on, hooked tip of apical recurved stria; surface usually more or less iridescent 15

14. Basal angles of prothorax obtuse .....
Tachys bradycellinus Hayw.
Basal angles of prothorax right. *Tachys occultator* Casey (and) *Tachys ensenadae* Mutchler.

15. Male with two joints of front tarsus dilated 16
Male with only basal joint of front tarsus dilated 20

16. Antennæ very slender (middle joints about three times as long as wide; tip of sixth reaching about to basal angle of prothorax); eyes moderate; length $\pm$3 mm. .....
Tachys albipes Lec.
Antennæ stouter and shorter; other characters variable 17

17. Eyes abruptly prominent, forming right angles with sides of head behind them; basal angles of prothorax obtuse but distinct; length just over 2½ mm. .....
Tachys abruptus n. sp.
Eyes less prominent, forming obtuse angles with sides of head behind them; other characters variable 18

18. Basal angles of prothorax very obtuse, almost rounded except for minute subprominent sinuation of margin; size ±2½ mm.....
Tachys putzeysi F. & S.
Basal angles of prothorax obtuse but rather distinct; size 2-2¼ mm.....19

19. Prothorax transverse, head relatively narrow (Pl. 1, fig. 1) .....*Tachys dominicanus* n. sp.
Prothorax less transverse, head broader.....
Tachys sp. (Guadeloupe & Montserrat.)

20. Surface of elytra with very fine, short, sparse pubescence .....*Tachys striax* n. sp.
Surface of elytra not pubescent.....21

21. Posterior angles of prothorax accurately and minutely formed; color testaceous with head scarcely darker....22
Posterior angles of prothorax finely blunted or bluntly subdenticulate; color castaneous, or partly testaceous with head much darker.....25

22. Form unusually slender, parallel.....23
Form broad.....24

23. Base of prothorax oblique at sides; eyes very prominent.
Tachys filax n. sp.
Prothorax squarely truncate at base; eyes less prominent .....*Tachys pumilus* Dej.

24. Median line of prothorax continued as a groove behind posterior transverse impression; first joint male front tarsus very wide; size ±2½ mm.....
Tachys cubax n. sp.
Median line of prothorax not continued behind posterior transverse impression; first joint male front tarsus relatively much narrower; size just under 2 mm.....
Tachys paulax n. sp.

25. Sides of prothorax sinuate before basal angles, which would be almost right except are slightly blunted; head and prothorax relatively narrow; size ±2½ mm.....
Tachys scitulus Lec.

Sides of prothorax scarcely or not sinuate before the basal angles, which are more obtuse; other characters variable 26

26. Color usually castaneous or darker; head and prothorax relatively narrower; antennæ more slender (middle joints more than twice as long as wide); first joint male front tarsus wider and with outer apical angle more strongly produced; size ±2½ mm. ..... *Tachys corruscus* Lec.

Color testaceous with head much darker; head and prothorax relatively wider; antennæ stouter (middle joints less than twice as long as wide); first joint male tarsus smaller; size 2 mm. or slightly less ..... *Tachys vorax* Lec.

27. Head moderate; prothorax not especially large; size about 1⅔ mm. ..... *Micratopus insularis* n. sp.

Head very small; prothorax relatively very large; size ±2 mm. (Pl. 5, fig. 3) ..... *Micratopus parviceps* n. sp.

28. Form slender; head relatively small; length 1½-1⅔ mm. (Pl. 5, fig. 2.) ..... *Limnastis americanus* n. sp.

Form less slender; head relatively large; length barely over 1 mm. ..... *Limnastis capito* Bates.

Bembidion (Peryphus) jamaicense n. sp.

Moderately slender, convex, upper surface faintly alutaceous but rather shining; dark rufous, appendages testaceous. Head rather long; eyes prominent; antennæ slender; front with inconspicuous median puncture; frontal sulci moderate, parallel; mentum with rounded-triangular tooth at middle. Prothorax subcordate, about one-third wider than long (by measurement); basal angles acute but not much more than right, strongly carinate; disk with transverse impressions moderate, longitudinal line strong. Elytra with first and second striæ entire, third nearly entire, fourth to sixth obliterated near apex except fifth apically sulciform, seventh indicated by a few faint punctures in basal half, eighth near margin; striæ moderately punctate basally,

smooth apically; intervals slightly convex, third with two distinct setigerous punctures practically on third stria. Length just over 4 mm.

Holotype ♂ (United States National Museum) and 1 ♀ paratype (Museum of Comparative Zoölogy no. 19498) from Jamaica, H. G. Hubbard.

This species is superficially similar to *Bembidion subangustatum* Hayw. (type examined) of New Mexico and Arizona, but, in addition to being considerably smaller, has a rather differently shaped prothorax and a larger head with more prominent eyes. Of the known Central American Bembidion it is related only to *rogersi* Bates, of which we have specimens, identified by description, from Cerro Central, Costa Rica. The Jamaican species is less convex, much paler, lacks æneous lustre, has the dorsal punctures of the elytra less impressed and nearer the third stria, has more slender antennæ, and differs slightly in other ways.

20. **Bembidion (Notaphus) sparsum** Bates.

21. **Bembidion (Notaphus) viridicolle** Laf.
chevrolati (G. & H.)
apicale J.-Duv.

22. **Bembidion (Notaphus) fastidiosum** Laf.

I have seen specimens from Haiti and Puerto Rico but none from Cuba, although the species is recorded as Cuban by Leng and Mutchler.

23. **Bembidion (Notaphus) darlingtoni** Mutchler.
affine auct., not Say.

Described in the *American Museum* (New York) *Novitates* no. 686, 1934, p. 3.

24. **Tachys (Tachyta) flavicauda autumnalis** Bates.
Tachys (Tachyta) hispaniolae n. sp.

Of average form for Tachyta; rufo-piceous to piceous black, rufescent below, appendages and a nearly round red spot at apical third of each elytron near middle of its width testaceous; upper surface entirely alutaceous.

Head: front with two slightly impressed, widely separated sulci slightly converging anteriorly; antennæ short, second joint shorter than third, middle joints hardly longer than wide; mentum without foraminiform punctures, with blunt tooth in emargination. Prothorax slightly more than a half wider than long (by measurement); sides rounded anteriorly, slightly and very gradually sinuate posteriorly; posterior angles acutely but very minutely denticulate, costæ within angles short and not conspicuous; lateral margins evenly explanate, wider than in *Tachys* (*Tachyta*) *inornata* (Say), less wide than in *T. flavicauda;* basal transverse impression deep, anterior faint, median line rather deep. Elytra only slightly depressed; sutural stria deep and entire, recurved as usual; other striæ all more or less abbreviated but all visible basally, either as impressed faintly punctate lines or (externally) as series of small punctures; fourth stria with fixed punctures near base and about apical third. Two basal joints of male front tarsus dilated and with anterior apical angles slightly produced. Length $\pm 2\frac{1}{2}$ mm.

Haiti, W. M. Mann: Holotype (Museum of Comparative Zoölogy no. 19499) and 3 paratypes from Grande Rivière; 2 paratypes from St. Marc.

This species is apparently not closely related to any of those known from North or Central America; its color pattern is unique. It is intermediate between the so-called genera Tachyta and Tachymenis as used by Casey (Memoirs 8, 1918, p. 3).

25. **Tachys (Pericompsus) blandulus** Schaum

26. **Tachys (Tachyura) xanthopus** (Dej.)

27. **Tachys (subgenus?) immaculatus** (Bates)

28. **Tachys (s. s.) occultator** Csy.

29. **Tachys (s. s.) bradycellinus** Hayw.

30. **Tachys (s. s.) cubax** n. sp.

Rather broad; not strongly depressed; rufo-testaceous with a small, vague, dark blotch common to both elytra

behind middle; very faintly opalescent. Head with eyes only moderately prominent; antennæ with middle joints about twice as long as wide; frontal sulci parallel, deep anteriorly, abbreviated and obsolete posteriorly; mentum toothed at middle, conspicuously bi-foraminate posteriorly. Prothorax just over a half wider than long (by measurement), squarely truncate at base and apex; disk with usual impressed lines, and with median longitudinal line continued posteriorly as a conspicuous groove behind the basal impression; base broad, angles obtuse but almost right, very precisely defined, not in the least blunted or rounded. Elytra each with seven striæ in addition to the marginal one, but the seventh almost obsolete; two inner striæ entire, others abbreviated apically; several inner striæ slightly impressed, outer ones very superficial; striæ slightly irregular but not distinctly punctate; anterior dorsal puncture close to fourth stria about a third or a fourth from base, posterior puncture within tip of recurved stria. Male with only first joint of anterior tarsus dilated, with anterior apical angle much prolonged and acute. Length ±2½ mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19500) and 1 ♂ paratype from Soledad (near Cienfuegos) Cuba, Oct. 28, taken under cover beside a little brook in a *saboruco* or patch of rough, scrubby woods; 1 ♂ paratype from San Carlos Est., Guantánamo, Cuba, Oct. 4-8 (American Museum); 1 ♂ specimen, not a type, from Bath, Jamaica, Apr. 3-6 (American Museum); 1 ♀ paratype from Cayamas, Sta. Clara, Cuba, Feb. 15, E. A. Schwartz (United States National Museum); 1 ♂ paratype from Jatibonico, Cuba, Oct. 30, in soil of sugar cane field, L. D. Christenson (U. S. N. M.).

The form of the first tarsal joint of the male distinguishes this species from all our North American Tachys *s. s.* except *corruscus* Lec. As compared with the latter *cubax* is differently colored, broader, less depressed, the frontal sulci are conspicuously shorter, the antennæ stouter, the prothorax broader at base with more precisely formed basal angles and with an extreme basal median channel. The two species are not really very closely related. *Cubax* is

probably closer to *Tachys platyderus* Bates, and its allies, of the Amazonian region, but the type of elytral striation combined with the barely sinuate sides of the prothorax apparently distinguish it from all of them.

In coining the name *cubax* I am following the example of Leconte, who made a habit of using two-syllable names ending in *ax* for species of this genus.

31. **Tachys (s. s.) paulax** n. sp.

Rather broad, not strongly depressed; rufo-testaceous with slight opalescent lustre. Characters in general the same as in the preceding species except that the sides of the prothorax are slightly more sinuate before the base, the median line of the prothorax is not continued behind the posterior transverse impression, the first joint of the male front tarsus is much less dilated, and the size is smaller. Length just under 2 mm.

Holotype ♂ (United States National Museum) and 1 ♀ paratype (Museum of Comparative Zoölogy no. 19501) from Cayamas, Sta-Clara, Cuba, March 2, E. A. Schwarz.

32. **Tachys (s. s.) albipes** Lec.

Tachys (s. s.) abruptus n. sp.

Broad, somewhat depressed; rather shining rufo-castaneous with slight iridescence, appendages paler. Head with abruptly prominent eyes which form right angles with the sides of the head behind them (when seen from a line perpendicular to the front); antennæ with middle joints less than twice as long as wide. Prothorax by measurement just over one and a half times as wide as long; sides barely sinuate before basal angles, which are obtuse but distinct; disk with usual impressed lines. Elytra broadly oval, each with about three inner striæ more or less distinct and one or two outer ones faintly indicated; striæ not distinctly punctulate; anterior dorsal puncture about on fourth stria a third from base, posterior puncture within recurved tip of apical striole. Male with two basal joints of each front tarsus rather widely dilated. Length just over 2½ mm.

Holotype ♂ (American Museum) and 4 paratypes (♂ ♂ ♀ ♀) from Gourbeyre, Guadeloupe; 3 paratypes (♂ ♀ ♀) from Long Ditton, Dominica, July 21, 1911. Paratypes in the Museum of Comparative Zoölogy (no. 19496) and the American Museum.

This species is distinguishable from its relatives (the preceding and the three following species) by its more abruptly prominent eyes, as well as by other characters given in the key.

Tachys (s. s.) putzeysi F. & S.

Gourbeyre, Guadeloupe, 7 specimens (American Museum). One specimen has been compared with the type in the Paris Museum by Dr. Jeannel, to whom I sent for comparison specimens of all five Lesser Antillean Tachys known to me.

Tachys (s. s.) dominicanus n. sp. (Pl. 5, fig. 1)

Rather broad and depressed; shining rufo-testaceous, iridescence very faint, appendages paler. Head relatively small, with poorly developed eyes; antennæ with middle joints rather less than twice as long as wide. Prothorax by measurement just over one and a half times as wide as long, sides oblique or just sinuate before the obtuse but distinct basal angles; disk with usual impressed lines. Elytra each with about two inner striæ distinct and several outer ones indicated; striæ irregular, almost punctulate; anterior dorsal puncture about on fourth stria a third from base, posterior puncture within recurved tip of apical striole. Male with two basal joints of each front tarsus moderately dilated. Length 2-2¼ mm.

Holotype ♂ (American Museum) and 16 paratypes from Long Ditton, Dominica, June 21, 1911. Paratypes in the Museum of Comparative Zoölogy (no. 19497) and American Museum.

The distinguishing characters of this species are sufficiently given in the key.

33. **Tachys (s. s.) scitulus** Lec.

34. **Tachys (s. s.) corruscus** Lec. (not typical)

35. **Tachys (s. s.) vorax** Lec.

36. **Tachys (s. s.) striax** n. sp.

Moderately stout, depressed; rufo-testaceous (elytra rarely piceous with base paler), iridescent lustre faint or absent; head only slightly darker. Head with eyes only slightly prominent; antennæ with middle joints about twice as long as wide; frontal grooves moderate, slightly converging anteriorly; front faintly micro-reticulate, with distinct small puncture at middle; mentum toothed at middle, with two large foraminiform perforations. Prothorax cordate, about a half wider than long (by measurement), sides strongly sinuate before the prominent and acute (but not much more than right) basal angles; usual discal impressions well marked. Elytra finely, sparsely, inconspicuously pubescent, (pubescence visible only under high magnification); with about five striæ including the sutural visible on each, the inner two or three somewhat impressed, irregularly and inconspicuously punctulate, or at least with sides of intervals irregular; sutural stria reaching base of elytron, it and second stria reaching apex (second sulciform apically), others abbreviated; anterior setigerous puncture almost on fourth stria about a third from base, posterior puncture within tip of hooked apical striole. Male with first joint of front tarsus moderately dilated, with anterior apical angle acutely but not strongly produced. Length 2 mm. or slightly less.

Holotype ♂ (Museum of Comparative Zoölogy no. 19502) and 19 paratypes from Soledad (near Cienfuegos) Cuba, June, Oct. 17 & 20, Nov. 7. One specimen was taken under a stone in a dry field; practically all the others, in a plowed field during a heavy flood. 1 paratype from Cayamas, Sta. Clara, Cuba, June 6, E. A. Schwarz (United States National Museum); 1 paratype from Cuba, Poey Collection no. 27 (Philadelphia Academy of Sciences).

This species is strongly characterized by the pubescent and striate elytra with the second stria sulciform apically. So far as I know, it has no close relatives.

37. **Tachys (s. s.) pumilus** (Dej.)

38. **Tachys (s. s.) filax** n. sp.

Slender, subdepressed; testaceous, rather shining. Head nearly as wide as prothorax; eyes very prominent; antennæ rather stout, middle joints about a half longer than wide, apex of eighth joint reaching about to base of prothorax; mentum with two foraminiform punctures. Prothorax cordate, slightly less than a half wider than long (by measurement); base oblique at sides; sides sinuate before the obtuse (but nearly right) posterior angles, which are accurately defined. Elytra each with two inner striæ slightly impressed and one or two others more or less indicated; striæ slightly irregular but not distinctly punctate; apical recurved stria well marked and long, but second stria scarcely visible at apex; anterior dorsal puncture on third interval near basal third, posterior puncture within tip of recurved stria. Length $\pm 1\frac{7}{8}$ mm.

Holotype ♀ (United States National Museum) and 1 ♀ paratype (Museum of Comparative Zoölogy no. 19503) from Cayamas, Sta. Clara, Cuba, E. A. Schwarz, Jan. 30 and Feb. 13. Also 1 (♂ ?) paratype from Cuba, Poey Collection no. 27 (associated with Poey specimen of preceding species) (Philadelphia Academy of Sciences).

This is a very graceful species which approaches the form of the *vittiger* group of Tachys, but has the characters of Hayward's *proximus* group. It is distinguished from *Tachys pumilus* (Dej.), apparently its nearest ally, by much more prominent eyes, base of prothorax oblique at sides, and more slender form.

39. **Limnastis americanus** n. sp. (Pl. 5, fig. 2.)

Small, slender, subdepressed; rufo-testaceous, head not darker. Head with front micro-reticulate; eyes small to very small (see below), flattened, sometimes slightly convex, sometimes actually concave; two supraorbital setæ each side, anterior one shorter; antennæ short, stout, outer joints moniliform; mentum without tooth in emargination. Prothorax by measurement about a third wider than long,

somewhat narrowed behind, sides broadly, not strongly sinuate before base; posterior angles obtuse or finely right; anterior angles without very conspicuous setæ; disk microreticulate, not obviously punctate, with fine, short sparse pubescence. Elytra reaching tip of abdomen, subtruncate, slightly dehiscent near apex; about three inner striæ faintly impressed on each elytron; intervals each with a single row of fine, short pubescence; one inconspicuous discal puncture on the outer edge of the third interval, almost on the third stria, a little behind the middle. Inner wings dimorphic, well developed or reduced to about a third elytral length. Male front tarsi each with two basal joints dilated. Length 1½-1⅔ mm.

Holotype macropterous ♂ (Museum of Comparative Zoölogy no. 19504) and 16 paratypes (3 macropterous ♂♂, 7 macropterous ♀♀, 3 micropterous ♂♂, and 3 specimens with wings not examined) all from Soledad (near Cienfuegos) Cuba, June, Oct. 27, Dec. 1; most of them taken by treading down dense vegetation floating in deep water. They may possibly have been carried there by floods, but were not in real flood debris. Also 4 paratypes (all macropterous ♀♀) from Cayamas, Sta. Clara, Cuba, Jan. 2 & 29, Feb. 7 & 13, E. A. Schwarz (United States National Museum).

The dimorphism of the inner wings is correlated with the size of the eyes. The macropterous specimens have the eyes larger, usually slightly transverse, separated below from the margin of the mouth by about half or less the diameter of the eye itself. The three micropterous males have the eyes smaller, almost evenly rounded, and separated from the mouth by about their own diameter.

This species is emphatically a Limnastis, not a Micratopus, as shown by comparison with several American species of the latter genus and with a specimen of *Limnastis macrops* Jeannel kindly sent me by Dr. Jeannel himself. In the latter's table of the genus (Livre Cent., Soc. Ent. France, 1932, pp. 174 -) the macropterous form of the Cuban species runs to near *L. coomani* Jeannel of Tonkin, but has smaller eyes and differs in other ways. This does not, of course, indicate an actual affinity between the Chinese and

Cuban species, for somewhat similar species of Limnastis occur over a large part of the Old World, including the Mediterranean region. There is even one, *L. gaudini* Jeannel, in the Canary Islands, but it is completely blind. Only one true Limnastis has been known before from the New World, *L. capito* Bates. This was described from Guatemala but occurs also in Cuba. Mr. K. G. Blair has very kindly compared a Cuban specimen for me with the type in the British Museum. The distinguishing characters of the two American species are given in the key, in the preceding pages.

40. **Limnastis capito** Bates.

41. **Micratopus parviceps** n. sp. (Pl. 5, fig. 3.)

Form and proportions as figured; body depressed; surface microreticulate but moderately shining; testaceous, head only faintly darker. Head very small, with small, flat eyes which scarcely break the outline of the sides of the head; middle joints of antennæ about twice as long as wide. Prothorax very large, broadly emarginate in front, sides of base oblique; basal angles very obtuse; disk depressed, median line distinct, basal transverse impression faint, anterior impression absent. Elytra depressed, independently rounded-subtruncate at apex; striation nearly complete, but striæ very fine, shallow, and inconspicuous; one dorsal puncture near apex of third stria. Length ± 2 mm.

Holotype (United States National Museum) and 5 paratypes from Jatibonico, Cuba, Apr. 9, Apr. 20, and July 8, L. D. Christenson, in soil of sugar cane fields. Paratypes in Museum of Comparative Zoölogy (no. 19505) and United States National Museum.

This species differs from *Micratopus ænescens* (Lec.) and *fusciceps* Csy. of the United States in having the elytral striæ very fine and inconspicuous; from *withycombei* Jeannel of Trinidad (Livre du Cent., Soc. Ent. France, 1932, 168) in having the basal angles of the prothorax much more obtuse. The new species is apparently unique in the small size of the head.

Micratopus insularis n. sp.

So similar to the preceding as not to require a full description. Differs (from *parviceps*) in being smaller, slightly more convex, with relatively smaller prothorax and larger head with larger, more prominent eyes. Length ±1⅔ mm.

Holotype (United States National Museum) and 1 paratype (Museum of Comparative Zoölogy no. 19506) from San Juan, Puerto Rico, Aug. 11, 1933, A. S. Mills, at light.

42. **Diplochaetus rutilus** (Chev.).

43. **Perileptus (s. s.) columbus** n. sp. (Pl. 5, fig. 4.)

Form and proportions as figured; depressed; entirely rufo-testaceous; upper surface with fine, short pubescence which does not conceal the underlying surface. Head across eyes by measurement barely narrower than prothorax, but appearing slightly wider; temples parallel for a short distance behind eyes before being constricted; front shining, obsoletely punctate; antennæ slender, median joints about three times as long as wide; mentum toothed, tooth subtruncate apically. Prothorax cordate; base more than two-thirds (by measurement) as wide as widest part; sides sinuate about one-sixth from base, thence nearly straight to the regular, right or slightly obtuse basal angles; lateral margin moderate, entire, crenate near base; disk rather finely and closely punctate, basal transverse line very deep, anterior line less deep, median longitudinal line well impressed. Elytra also rather closely and finely punctate; sutural stria distinct except at base, one or two next striæ vaguely indicated; three discal punctures on position of third stria on each elytron, about a fifth from base, just behind middle, and about a tenth from apex respectively. Male with first two joints of front tarsus somewhat dilated. Length 2¼-2¾ mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19507) and 9 paratypes (2 in collection Jeannel), including both sexes, from Soledad (near Cienfuegos) Cuba, Oct. 27 & 28,

Nov. 24, Dec. 1, taken in gravel bars beside woodland brooks.

For comparative remarks see under the following species.

Perileptus (s. s.) jeanneli n. sp.

Form closely similar to that of the preceding species; depressed; piceous; mouth, bases of antennæ, palpi, legs, and feet rufescent to testaceous. Head: antennæ very slender, median joints about four times as long as wide; head otherwise about as in *columbus*. Prothorax cordate, strongly constricted at base, which is very slightly less than two thirds as wide as widest part; basal angles right. Elytra with sutural stria very lightly impressed, obsolete at base; other striæ barely or not at all suggested by irregularities of the elytral surface; three dorsal punctures on position of (obsolete) third stria. Length 3 mm. or slightly less. Male not known.

Holotype ♀ (Museum of Comparative Zoölogy no. 19508) and 6 paratypes (2 in collection Jeannel) from Kingston, Jamaica, Feb. 14, 1928; taken in gravel bars of a large stream in the outskirts of the city during half a day of collecting, all that I have ever done on the island.

This species is close to the preceding, but is perfectly distinct by the much darker color, more slender antennæ, relatively narrower prothoracic base, and slightly larger size. Both species belong to the *areolatus* group of Perileptus. Dr. Jeannel, who has very kindly examined specimens sent to him and confirmed my identification of them as Perileptus, writes that the two West Indian species differ from previously known species of the *areolatus* group only in being more depressed, more closely punctate, and with the elytral striæ more effaced. They are especially closely related to *P. nigritulus* Woll. of Madeira.

No species of Perileptus, and indeed none of the Perileptini, has been known before from the New World. The West Indian species are especially interesting in that the well characterized *areolatus* group to which they belong is known otherwise (according to Dr. Jeannel's fine mono-

graph in l'Abeille, Vol. 32, 1926, pp. 402 -) only in Europe, North Africa, and the Atlantic Islands.

44. **Panagaeus quadrisignatus** Chev.
thomae Schaum.

45. **Coptia sauricollis** n. sp. (Pl. 5, fig. 5.)

Piceous black, shining, with rather inconspicuous pale pubescence; antennæ (except the three basal joints, which are dark), palpi, and tarsi testaceous; tibiæ and parts of femora more or less reddish. Head nearly smooth except irregularly bi-impressed between eyes; clypeus impressed each side, impressions joined by a fine, arcuate line; mentum shallowly emarginate, with a pronounced rounded tooth in emargination; antennæ slender, apex of eighth joint reaching about to base of pronotum, third joint slightly longer than following ones. Prothorax very broad, much narrowed anteriorly, emarginate in front, bi-spinose each side at base; lateral margins very deeply channeled anteriorly, gradually obliterated posteriorly near first spine; disk coarsely punctate, finely pubescent, surface between punctures shining. Elytra deeply crenato-striate; intervals convex, shining, but with minute punctures bearing fine pubescence. Lower surface shining, only partly pubescent; epipleuræ below humeri impunctate and almost without pubescence; sides of pro-, meso-, and metathorax almost without pubescence, coarsely punctate; ventral segments with only comparatively fine punctuation except sides of basal segments with a few coarse punctures. Male tarsi not dilated. Length 5¾-7; width 3-3¾ mm.

Holotype ♀ (Museum of Comparative Zoölogy no. 19509) and 6 paratypes, including both sexes determined by dissection, from Soledad (near Cienfuegos) Cuba, June, Nov. 7 & 21; all collected by myself in flood debris.

Coptia, previously known only from two species occurring in Cayenne, Venezuela, and Brazil, differs from Panagæus essentially only in having the front tarsi similar in the two sexes; secondary differences are that the antennæ are more slender in Coptia, with proportionately shorter third joint,

and that the body is less obviously pubescent, more shining, and not spotted. We possess a single specimen of *C. armata* (Cast.) from St. Augustine, Trinidad. This species is figured by Kollar (Ann. Wiener Mus. 1, 1836, t. 31, figs 3a, b) and both previously known species have been accurately described and compared by Chaudoir (Ann. Soc. Ent. Belgique 21, 1878, 167-9). The present species differs from them, *i. e.* from *Coptia armata* (Cast.) and *C. marginicollis* Chd., in having a differently shaped prothorax, less narrowed anteriorly, with the basal spines better developed.

46. **Coptia effeminata** n. sp. (Pl. 5, fig. 6.)

Black, rather shining, with inconspicuous pale pubescence; antennæ (except three darker basal joints), palpi, and tarsi brownish. Head nearly smooth except bi-impressed between eyes; clypeus impressed each side, transverse arcuate line faint; mentum shallowly emarginate, with a broad short tooth in emargination; tooth truncate, even slightly emarginate apically; antennæ with apex of eighth joint reaching about to base of prothorax, third joint slightly longer than following one. Prothorax broad, narrowed anteriorly, emarginate in front, unidentate (not bispinose) each side of base; lateral margin gradually obliterated anteriorly, not deeply channeled; disk somewhat depressed near posterior angles, coarsely punctate, moderately pubescent. Elytra above about as in preceding species. Lower surface shining, mostly inconspicuously pubescent; epipleuræ below humeri with two widely separated rows of coarse punctures; all ventral segments with very coarse punctuation across their entire width. Length $\pm 8\frac{1}{2}$; width ± 4 mm.

Holotype ♀ (Museum of Comparative Zoölogy no. 19510) from Soledad (near Cienfuegos) Cuba, Nov. 9, taken at light at "Harvard House." Paratypes: 1 ♂ (sex determined by dissection) from Central Jaronú, Cuba, July 10, at light, L. C. Scaramuzza (United States National Museum); 1 (sex not determined) from Baraguá, Cuba, Nov. 12, at light, C. F. Stahl (U. S. N. M.); 1 (sex not de-

termined) from Camagüey, Cuba, Aug.-Sept., J. M. Osorio (Collection Estación E. Agronómica, Cuba).

This species differs radically from *Coptia sauricollis* in the much reduced armature of prothorax, absence of deep channeling in prothoracic margin anteriorly, and punctuation of epipleuræ and abdomen. The species represents in these ways an approach to Panagæus, but is nevertheless referable to Coptia, as shown by the narrow male tarsi, sparse pubescence, etc.

47. **Morion georgiae** (Beauv.).
monilicornis (Latr.).

Morion costigerus n. sp.

Parallel, subdepressed, entirely black, somewhat shining. Head: clypeus obtusely quadridentate; front with two longitudinal, somewhat sinuous sulci anteriorly; eyes less abruptly prominent than in *georgiæ*. Prothorax formed nearly as in *georgiæ* but more elongate, only about a tenth (by measurement) wider than long. Elytra with moderately impressed striæ, latter impunctate; intervals only slightly convex except that seventh is strikingly costiform in about basal third; sixth interval sloping inward basally so that fifth stria is at bottom of an obtuse V-shaped depression; third interval with single puncture near second stria just before apical third. Last ventral with one setigerous puncture about a third from apex on each side. Hind trochanters practically half as long as femora, rounded apically. Length 17-20 mm.

Jamaica: holotype (Museum of Comparative Zoölogy no. 19511) from Newton, 3,000 ft., Jan., C. T. Brues; 1 paratype (M. C. Z.) from Cinchona, 5,000 ft., Jan., Brues; 2 paratypes (American Museum) from Cumberland District, Clarendon, Dec. 15-18, about 3,000 ft.

This species may be known at once from all previously described American Morion by the very conspicuously costate seventh elytral intervals, which are much more elevated than in *M. simplex* Dej. Otherwise it somewhat resembles a very large, slender *M. georgiæ*, with which it agrees absolutely in all characters of generic value.

48. **Pterostichus (Poecilus) chalcites** (Say).

49. **Loxandrus nocticolor** n. sp.

Of average form for Loxandrus; shining black, without evident iridescence; tarsi, palpi, and basal joints of antennæ partly or irregularly rufous. Head normal for genus; clypeus and front anteriorly longitudinally impressed each side; mentum tooth moderate, rounded truncate apically as usual. Prothorax a fourth or a third wider than long (by measurement); margin moderate, not wider or more explanate basally; sides almost evenly rounded from apex to base; base obliquely rounded each side to the very obtuse basal angles; disk rather flat; median line fine, abbreviated at both ends; basal foveæ deep, linear, about a third length of prothorax; base near foveæ finely, sparsely punctate. Elytra rather convex, deeply striate; striæ impunctate; intervals convex, third with puncture on inner edge before middle. Front tarsi of male with joints obliquely dilated. Length 10½ mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19512) and 1 ♀ paratype from Soledad (near Cienfuegos) Cuba, Oct. 21, taken in flood debris.

Absence of iridescent lustre combined with unusual depth and perfect smoothness of the elytral striæ make this an unusually well characterized species.

50. **Loxandrus celeris** (Dej.).
cubanus Tsch.
cruentatus (Chev.) (*Stenolophus*).

For some time I have suspected the identity of *Stenolophus cruentatus* Chev. with this species, and recently Mr. K. G. Blair has compared a specimen sent to him with Chevrolat's type (at Oxford) and confirmed my suspicions.

51. **Loxandrus crenatus** Lec.

Colpodes M'Leay and Glyptolenus Bates

The following table of the known West Indian species of these genera will show the systematic position of the several

new species described below, and at the same time will summarize the West Indian fauna. I have placed asterisks before the species I have not seen. The table is based on Chaudoir's monograph (Ann. Soc. Ent. France (5) 8, 1878, pp. 279 -). The only species I have not been able to place in the table is *Metallosomus cuprascens* Mots., which is omitted in Chaudoir's monograph. The species may be near *mannerheimi*. It was described from Santo Domingo.

1. Metepisterna only a little longer than wide; color dark brown or black 2
   Metepisterna very elongate; color variable 4

2. Elytra narrowly and regularly ovate; humeri obliterated; Length 9½ mm.; Martinique and Dominica .....
   C. ellipticus Chd.
   Elytra not evenly ovate; humeri distinct .....

3. Length ±8-9 mm.; Jamaica ..... *C. cinchonæ* n. sp.
   Length ±11 mm.; Santo Domingo .....
   **C. jægeri* Dej.
   Length 13-15 mm.; Jamaica ..... *C. macer* n. sp.

4. Tibiæ canaliculate above; prothorax subquadrate 5
   Tibiæ not canaliculate above; prothorax variable 6

5. Color nearly uniform piceous brown; elytra strikingly short, broad, and convex; side margins of prothorax very narrow anteriorly; 7½ mm.; Dominica .....
   Glyptolenus simplicicollis n. sp.
   Black, elytra bluish, relatively narrow; side margins of prothorax normal; 7 mm.; Guadeloupe (and Brazil) .....
   C. chalybeus Dej.

6. Fourth joint of posterior tarsus strongly lobed externally 7
   Fourth joint of posterior tarsus not or scarcely more strongly lobed externally than internally; color never metallic 8

7. Dark piceous, elytra cœruleo-viridescent; 11⅓ mm.; Santo Domingo ....**C. mannerheimi* Chd. (*jägeri* Mann.)
   Without metallic lustre; 12 mm.; Jamaica .....
   C. vagepunctatus n. sp.

8. Odd intervals (except first) of elytra foveolate; 10 mm.; Guadeloupe ..... **C. alternans* Chd.
   Odd intervals of elytra not foveolate 9
9. Striæ of elytra interrupted; 9 mm.; Haiti ..... *C. fractilinea* n. sp.
   Striæ of elytra not interrupted 10
10. Head relatively narrow, less than half width of elytra at widest point 11
    Head more than half as wide as elytra at widest point 12
11. Brown, dull; striæ of elytra lightly impressed; sides of prothorax broadly, not strongly rounded; 8-11 mm.; Guadeloupe ..... *C. dejeani* Chd. (*brunneus* Dej.)
    Black, shining; elytral striæ more impressed; sides of prothorax more strongly rounded; 10.5 mm.; Cuba ..... *Colpodes* sp.
12. Length 8-10 mm.; Guadeloupe ..... *C. lherminieri* Chd.
    Length 10-13 mm.; Guadeloupe ..... **C. elongatus* Chd.
    Length 13-17 mm.; Guadeloupe ..... **C. memnonius* Dej.

Colpodes cinchonae n. sp.

Slender, elongate, rather depressed; piceous, appendages rufo-testaceous. Head relatively broad, with usual impressions anteriorly; front smooth; antennæ rather slender. Prothorax only about a fifth or less wider than head across eyes, about as long as wide (by measurement); lateral margin rather narrow for genus; posterior angles right but finely blunted; disk somewhat shining, with usual impressions. Elytra broadly sinuate near apex; apices slightly prolonged, each subangulate; striæ rather fine, impunctate; intervals nearly flat, dull and alutaceous, third tripunctate, the first puncture near the third stria about basal fifth, others near second stria about middle and apical third. Inner wings vestigial. Metepisterna short; tibiæ not canaliculate externally; tarsi lightly sulcate at sides above, the sulci widely separated, fourth joint bilobed but scarcely produced externally, fifth joint not ciliate; male tarsi slightly dilated. Length ±8-9 mm.

Holotype ♀ (Museum of Comparative Zoölogy no. 19513) from Cinchona Jamaica, 5,000 ft., Jan., C. T. Brues; 11 paratypes (American Museum and M. C. Z.) from the same locality, Feb. 26.

In Chaudoir's tabulation of Colpodes (*l. c.*) this species would fall nearest to *C. sphodroides* Chd. and *C. pristonychoides* Chd. of Mexico, but it is much more slender than either, with a relatively larger head, as shown by comparison with our small series of *sphodroides* from "Biologia" material. It is very similar indeed to *Colpodes lherminieri* Chd., but the metepisterna are much shorter, the head relatively larger, and the elytra more opaque than in that species.

Colpodes macer n. sp. (Pl. 5, fig. 7.)

Elongate; rather depressed; rufo-testaceous (immature) to piceous, appendages scarcely paler; upper surface finely alutaceous. Head very elongate; eyes rather large but less prominent than usual in genus; antennæ slender, middle joints about three times as long as wide; mentum at middle of emargination with a long slender tooth, pointed or very narrowly truncate at apex. Prothorax (by measurement) as long as wide, but appearing longer; sides rather widely reflexed; basal angles obtuse, narrowly rounded; disk with fine median longitudinal line and broad vague basal and apical transverse impressions, also with lateral impression on each side from near basal angles forward and outward to in front of middle. Elytra elongate, prolonged and independently subangulate apically; margin broadly, slightly sinuate near apex; striæ entire, rather deep, impunctate; intervals slightly convex, third with three inconspicuous punctures. Inner wings vestigial; metepisterna short. Tibiæ not canaliculate externally; tarsi sulcate, sulci widely separated, fifth joint not ciliate, fourth not lobed externally on middle and hind feet; male anterior tarsi slightly dilated. Length 13-15 mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19515) from Cinchona, Jamaica, 5,000 ft., Jan. 1912, C. T. Brues;

2 (♂ ♀) paratypes from the same locality, Feb. 27, 1911 (American Museum).

This species is allied to the Central American *Colpodes championi* Bates, *eueides* Bates, and especially *severus* Chd., of which last there is a single specimen from Guatemala in the Museum of Comparative Zoölogy. *C. macer* differs from all of them in its more slender form, more prolonged elytral apices, more elongate head, and more widely reflexed prothoracic margins.

Colpodes vagepunctatus n. sp.

Moderately broad, rather depressed; surface not strongly shining, with inconspicuous silky texture; rufo-piceous, without metallic lustre, legs not paler, antennæ dark rufous at base, testaceous with darker stripes from apex of fourth joint. Head longitudinally bi-impressed in front of eyes; mentum tooth triangular, pointed. Prothorax large, about a third wider than long (by measurement), slightly convex, slightly more narrowed in front than behind; sides more or less evenly rounded from base to apex; lateral margins moderately widely reflexed; basal angles indistinct, rounded-obtuse; disk with median line fine, transverse impressions poorly defined, basal foveæ rather broad and deep, vaguely rugose, surface of disk otherwise smooth except vaguely transversely wrinkled near median line. Elytra with humeri distinct, apices sinuate and slightly produced, sutural angle right; striæ rather deep, slightly irregular but not distinctly punctate; intervals slightly convex; anterior dorsal puncture on third stria about basal fifth, second and third punctures on third interval near middle and apical fourth, slightly variable, second tending to be nearer second stria, third nearer third. Tibiæ not sulcate externally; front tarsi with indistinct sulci each side above, hind tarsi sulcate each side; fourth joint hind tarsus strongly lobed externally, fifth joint not ciliate. Metepisterna long; inner wings reduced, about half elytral length (possibly variable). Length ±12 mm.

Holotype ♀ (United States National Museum) and 1

damaged ♀ paratype (Museum of Comparative Zoölogy no. 19516) from Jamaica, H. G. Hubbard.

In Chaudoir's key (*l. c.*) this species runs to page 284, the first *z*, and falls between *o* and *oo*, fitting neither. It differs from all structurally comparable species under both parts of the couplet in the entire absence of metallic lustre. It is not like any of the species described in "Biologia."

Colpodes fractilinea n. sp.

Moderately broad; very shining; rufo-piceous, without metallic lustre, femora scarcely paler, tibiæ rufo-testaceous, antennæ and tarsi testaceous. Head longitudinally bi-impressed in front of eyes; mentum tooth rounded-triangular. Prothorax large, nearly a half wider than long (by measurement), slightly convex, somewhat narrower in front than behind; sides nearly evenly rounded; lateral margins moderate, reflexed; basal angles obtuse but distinct; disk with median line fine, transverse impressions poorly marked, basal foveæ rather broad, moderately deep; surface smooth. Elytra with humeri distinct; apices slightly produced, independently irregularly rounded; striæ fine, especially externally, and interrupted to form series of more or less elongate impressed lines; scutellar stria long, better impressed; intervals flat; anterior dorsal puncture on third stria near basal fifth, second and third punctures on second stria near middle and apical fourth. Tibiæ not sulcate externally; front tarsi not sulcate above; hind tarsi sulcate on outer side, not distinctly so on inner; fourth joint hind tarsus bilobed but only slightly more produced externally than internally; fifth joint not ciliate. Metepisterna long; inner wings not reduced. Length just over 9 mm.

Holotype ♂ (United States National Museum) from Diquini, Haiti, J. B. Ferris; unique.

In Chaudoir's table (*l. c.*) this species runs to page 282, "III, 2, b" (*C. aphædrus* etc.). The lack of metallic lustre alone is enough to distinguish it from most of the species of this group, and the interrupted elytral striæ are different from those of any species of the *aphædrus* group listed by Chaudoir.

52. Colpodes sp.

The only Colpodes I have seen from Cuba is a single specimen of an undetermined species (briefly characterized in my key) from Somorrostro, (Havana), coll. Barro.

Glyptolenus simplicicollis n. sp

Piceous brown, abdomen, epipleurae, and appendages rufescent. Head bi-impressed between front margins of eyes; eyes large but not very prominent; front smooth. Prothorax subquadrate, only slightly wider than long (by measurement), slightly narrower in front than at base; posterior angles obtuse, preceded by a minute sinuation of the sides, which are otherwise nearly evenly, very broadly rounded throughout; lateral margins very narrow anteriorly, gradually broader and reflexed in posterior half; base truncate at middle, somewhat rounded-oblique at sides; disk with usual impressions, but without extra transverse rugae. Elytra relatively very broad, convex, rather deeply striate, striæ slightly uneven but not distinctly punctate; intervals somewhat convex, third very inconspicuously bipunctate, the punctures before basal fourth and behind middle. Metepisterna slender. Tibiæ canaliculate externally; tarsi strongly sulcate above; male tarsi slightly dilated. Length 7½ mm.

Holotype ♂ (American Museum) from Laudet, Dominica, June 9, 1911; unique.

This species is a Glyptolenus as the genus was used by Bates in "Biologia" (Coleop. 1, part 1, p. 98). The genus is hardly distinct from Colpodes. *G. simplicicollis* differs from all previously described species in the combination of non-rugulose pronotum and impunctate elytral striæ. The general appearance of the insect is much like that of a stout Anchonoderus.

53. Agonum (Anchomenus) extensicolle cubanum n. subsp.

extensicollis Chev.

extensicolle Gundlach (not Feronia extensicolle Say).

Head and prothorax rather bright green, but very alutaceous and not strongly shining; elytra dull brown-bronzed,

outer edges green; base of antennæ, palpi, legs dull brown. Length 7¾-9 mm.

Cuba: holotype ♂ (Museum of Comparative Zoölogy no. 19517) and 8 paratypes from Soledad (near Cienfuegos), "Jan.-Feb." (C. T. Brues), July 1 (B. B. Leavitt), Oct. 31, Nov. 11; 1 paratype from Marcata, Rio Bayamo (M. C. Z.); 2 paratypes from Baraguá, Camagüey, at light, May 3 & 5 (L. C. Scaramuzza) and May 29 (L. D. Christenson) (United States National Museum); two discolored specimens, not types, from Cayamas, Sta. Clara, May 26 and June 1, E. A. Schwarz (U. S. N. M.); 1 paratype from Camagüey, "Aug.- Sept.," J. M. Osorio (Collection of Estación E. Agronómica); 2 discolored specimens from Baraguá, at light, Nov. 2, L. C. Scaramuzza, and Cumanayagua, Sta. Clara, June, F. de Zayas (both in Est. E. Agronómica). My specimens were taken in very coarse gravel beside the Arimao River.

The Cuban subspecies differs from true *Agonum extensicolle* (Say) of the eastern United States, and from practically all other forms of the species occurring on the continent north of Mexico, in having the legs infuscate, not testaceous. From Mexican specimens and others with brown legs the Cuban ones differ in the much brighter green head and prothorax.

54. **Anchonoderus subtilis** Bates.

55. **Lachnophorus leucopterus** Chev.

56. **Euphorticus pubescens æneolus** Bates

57. **Perigona nigriceps** (Dej.)

58. **Perigona laevigata** (Bates)

59. **Perigona picea** n. sp.

Slender (for the genus), rather convex; rufo-testaceous (immature) to piceous, elytra with faint opalescence in certain lights; head and disk of prothorax darker, mouth parts and appendages testaceous. Head: mandibles rather long, curved, acute; eyes moderately prominent; antennæ stout; mentum with a triangular tooth in emargination.

Prothorax by actual measurement about a fourth wider than long at middle, but appearing almost as long as wide; sides not sinuate, barely convex in profile before the rounded-obtuse basal angles; disk with a fine longitudinal line but no transverse impressions, vaguely impressed each side near base. Elytra each with two inner striæ distinct except at extreme base and apex, irregularly punctulate; several outer striæ more or less faintly visible; marginal stria normal for Perigona. Length 3-4 mm.

Holotype (Museum of Comparative Zoölogy no. 19518) and 2 paratypes from Grande Rivière, Haiti, W. M. Mann; 1 paratype from Diquini, Haiti, Mann (M. C. Z.); 1 paratype from San Carlos Estate, Guantánamo, Cuba, Oct. 4-8 (American Museum); 1 paratype from Cayamas, Sta. Clara, Cuba, Baker (United States National Museum); 1 paratype from Yateras Dist., Oriente, Cuba, W. M. Mann (U. S. N. M.); 2 paratypes from Cuba, Poey Collection no. 645 (Philadelphia Academy of Sciences); 1 paratype from Santo Domingo, A. Busck (U. S. N. M.); 1 specimen, not a type, from Gourbeyre, Guadeloupe (American Museum).

For relationships of this species, see key below.

Perigona microps n. sp. (Pl. 5, fig. 8.)

Form average for genus; irregularly castaneous, elytra with faint opalescent lustre, suture and parts of prothorax more rufescent, mouth and appendages testaceous. Head with mandibles elongate; eyes small, not prominent, only slightly breaking the outline of sides of head; antennæ moderate, less stout than in *picea;* mentum with a small tooth in emargination. Prothorax about a fourth wider than long; sides oblique but scarcely or not sinuate before the obtuse but not rounded posterior angles; disk about as in *picea.* Elytra each with two or three inner striæ slightly impressed except at base and apex; several outer striæ suggested by faint irregularities of the surface in proper light; striæ irregular but hardly distinctly punctate. Length $\pm 3\frac{1}{4}$ mm.

Puerto Rico: holotype (United States National Museum) from Bayamon, Jan.; 1 paratype (Museum of Comparative

Zoölogy no. 19519) from Fajardo, Feb. Both specimens taken by Aug. Busck.

As compared with *Perigona picea,* this species is broader, less convex, with more slender antennæ, better defined prothoracic angles, less distinct elytral striæ, and especially smaller eyes. For other distinguishing characters see the following key to the West Indian species of Perigona, of which I have seen all except *guadeloupensis.*

1. Color chiefly testaceous, head and apices of elytra blackish; length 3 mm. or less; cosmopolitan ..... *nigriceps* Dej.
   Color piceous to testaceous (immature), apices of elytra not contrastingly darker; length 3 mm. or more 2
2. Sides of prothorax sinuate before base; 3½ mm.; Guadeloupe ..... *guadeloupensis* Fleut. & Sallé
   Sides of prothorax not, rarely just barely, sinuate 3
3. Eyes only slightly breaking outline of sides of head (Pl. 5, fig. 8.) ..... *microps* n. sp.
   Eyes much more prominent 4
4. Elytra without distinct striæ near suture; body broader, more depressed; 4-5 mm.; Cuba, Puerto Rico (and Central America) ..... *lævigata* Bates.
   Elytra each with at least two distinct, more or less punctate striæ near suture; more slender and convex; 3-4 mm. ..... *picea* n. sp.

60. **Badister seclusus** Blatchley.

61. **Chlaenius niger ludoviciana** Leng.
    niger Gundlach, not Randall.

This is one of the few Carabidæ known from Cuba of which I have not seen Cuban specimens.

62. **Chlaenius gundlachi** Chd.

63. **Chlaenius cubanus** Chd.
    poeyi Gundlach, not Chevrolat.

64. **Chlaenius perplexus** Dej.
    circumcinctus Say.
    poeyi Chev.

65. **Rembus laticollis** Lec.

66. **Anatrichis picea** (Mots.).

67. **Oodes amaroides** Dej.

Recorded from Cuba by Gundlach, but I have not yet seen a Cuban specimen.

68. **Stenocrepis (Crossocrepis) sulcatus** Chev.

69. **Stenocrepis (s. s.) insulanus** (J.-Duv.)

70. **Stenocrepis (s. s.) duodecimstriata** (Chev.)
lecontei (Chd.).

71. **Stenocrepis (Stenous) tibialis** (Chev.)
femoralis (Chd.).
pallipes Gundlach, not Reiche.

Gundlach's short description evidently applies to this species rather than to the true *S. pallipes* (Reiche) of South America.

72. **Stenocrepis (Stenous) metallicus** (Dej.)

Stenocrepis (Stenous) subdepressus n. sp.

Of usual form for Stenous, but less convex; black, with greenish or bluish green lustre, head and margins of body scarcely brighter; legs entirely piceous or rufo-piceous, antennæ piceous with three basal joints rufescent. Head shining, nearly impunctate, but with exceedingly fine, rather sparse punctuation; mentum tooth long and acute. Prothorax moderately narrowed in front, slightly behind; sides scarcely sinuate before the right or slightly obtuse basal angles; disk rather strongly flattened basally, finely alutaceous. Elytra each with seven fine, slightly abbreviated, impunctate striæ, seventh finer than others; scutellar stria distinct; intervals flat, finely alutaceous but somewhat shining, third impunctate. Front tarsi of male rather widely dilated, about as in *S. metallicus* Dej. Length $\pm 8\frac{1}{2}$ mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19520) and 2 (♀ ♀) paratypes from Grande Rivière, Haiti, W. M. Mann.

In Chaudoir's monograph of Stenous (Ann. Soc. Ent. France (6) 2, 1882, pp. 497-) this species runs to *metallicus* Dej., which it resembles in most points of structure, but in addition to being a broader and flatter insect, *subdepressus* is differently colored and has the head practically impunctate, the prothorax slightly more narrowed posteriorly, and the third elytral interval without dorsal punctures The bluish green, almost uniform coloration and slightly depressed form are strongly suggestive of some Selenophorus.

Stenomorphus manni n. sp.

Elongate, parallel, moderately convex; shining rufo-testaceous to piceous brown, lower surface and appendages slightly more rufescent. Head with two rather small, abrupt foveae anteriorly; front smooth. Prothorax elongate in male (about five-eighths as long as elytra), less elongate in female; widest just behind middle; sides parallel (♀) or very slightly converging (♂) anteriorly, somewhat contracted and broadly but slightly sinuate before the rounded basal angles; disk with fine median line and oblique linear basal foveae, also with faint transverse undulate strigæ, surface not punctate. Elytra somewhat emarginate at base; striæ deep and impunctate; intervals convex, third with a series of punctures on inner edge, fifth with six or fewer irregular punctures either at middle or near edges. Sexual tarsal characters as usual in genus; male middle femora only minutely denticulate on lower edge near apex; middle tibiæ straight in both sexes; hind tarsi slender. Length ±12 (♀)-15 (♂) mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19525) and 4 (♂ ♀ ♀ ♀) paratypes from Manneville, Haiti, W. M. Mann.

This, the first Stenomorphus to be found in the West Indies, is very close to *rufipes* Lec. of the United States but is slightly more slender, with the middle femora of the male more minutely denticulate and the male middle tibiæ not even slightly arcuate as they are in *rufipes*.

73. **Gynandropus subquadratus** Putz.

Key to West Indian Selenophorus

The following brief and rather artificial key includes chiefly species which I have seen myself. Three other species, marked with asterisks, are merely inserted in the proper places from description, without final distinguishing characters being given. Of species recorded from the West Indies I have been unable to place only *Selenophorus lucidus* Dej., described as *probably* from the Antilles, (near *discopunctatus*), and *subaeneus* Reiche, not known from north of Guadeloupe (probably also near *discopunctatus*). I have been aided in my identifications in this difficult genus by brief notes on some of Putzeys' types from Mr. A. d'Orchymont, and by comparison of specimens with the type of *S. integer* (Fab.) made for me by Dr. Joseph Bequaert.

1. Elytra with series of distinct punctures on second, fifth, and seventh striæ 2
   Elytra without seriate punctures ..... *nonseriatus* n. sp.

2. Surface of elytra entirely pubescent; 7-8 mm. ..... *pubifer* Putz.
   Most of elytral surface glabrous 3

3. Elytra dark, shining, with bluish, greenish, or cupreous iridescence 4
   Elytra without iridescence 9

4. Basal foveae of prothorax impunctate or nearly so 5
   Basal foveae of prothorax rather closely, though not coarsely, punctate 6

5. Seventh elytral interval near apex greatly swollen laterally, overhanging margin at sinuation; ±10 mm. ..... *carniger* Putz.
   Seventh interval not swollen; 7-8 mm. ..... *flavilabris* Dej.

6. Length over 7 mm. 7
   Length under 7 mm. 8

7. Sides of prothorax parallel, scarcely arcuate; elytral striæ punctulate ..... *integer* Fab.
   Sides of prothorax more arcuate; striæ not punctulate. *chalybeus* Dej.
   (and) *propinquus* Putz.
   (and) *puertoricensis* Mutchler.

8. Elytral striæ punctulate ..... *striatopunctatus* Putz.
   Elytral striæ not punctulate ..... *puncticollis* Putz.

9. Surface of elytra not alutaceous ..... (refer back to) 5
   Surface of elytra alutaceous 10

10. Color rufous with elytral intervals no. 2 to 5 or 6 blackish 11
    Color above nearly uniform 12

11. Male with basal angles of prothorax slightly prominent posteriorly ..... *thoracicus* Putz.
    Male with posterior angles of prothorax obtusely rounded, like female ..... *cinctus* Putz.
    and (doubtfully Antillean) **dubius* Putz.

12. Front shining, not alutaceous 13
    Front finely but distinctly alutaceous 15

13. Basal foveæ of prothorax not distinctly punctate; 4½ mm. ..... *parvus* n. sp.
    Basal foveæ of prothorax extensively punctate 14

14. Form relatively broad, less convex; less shining; just over 5 mm.; Cuba ..... *solitarius* n. sp.
    Narrower and much more convex; head and pronotum highly shining; just under 5 mm.; Haiti ..... *haitianus* n. sp.

15. Basal angles of prothorax right; seriate punctures of elytra much larger than usual 16
    Basal angles of prothorax broadly rounded; seriate punctures small 17

16. Length ±8-9 mm. ..... *pyritosus* Dej.
    Length under 8 mm. ..... *alternans* Dej.

17. Margins of elytra excised near apex; 4½-5½ mm.....
sinuatus Gyll. (and) **mundus* Putz.
and (doubtfully Antillean) **parumpunctatus* Dej.
Elytra only slightly sinuate near apex; 6 mm. and over 18

18. Base of prothorax alutaceous and irregularly punctate; 6-8 mm.....*discopunctatus* Dej.
Base of prothorax alutaceous but not punctate.....19

19. Color dull blue; ±11½ mm.....*cyaneopacus* n. sp.
Greenish, cupreous, or æneous; not over 8 mm.....20

20. Prothorax rather strongly narrowed posteriorly; 7-8 mm.....*beauvoisi* Dej.
Prothorax not distinctly narrowed posteriorly; ±6 mm.
latior n. sp.

74. **Selenophorus pyritosus** Dej.

75. **Selenophorus alternans** Dej.

76. **Selenophorus cinctus** Putz.
Selenophorus thoracicus Putz. (♀)
excisus Putz. (♂)

I have seen twelve males and six females of this Haitian species and am convinced that the differences supposed by Putzeys to separate his two species are merely sexual.

77. **Selenophorus flavilabris** Dej.

78. **Selenophorus sinuatus** (Gyll.)
parumpunctatus Chev., & Gundlach, not Dej.

79. **Selenophorus discopunctatus** Dej.
cuprinus Dej.

80. **Selenophorus striatopunctatus** Putz.
Selenophorus parvus n. sp.

Form average, not especially convex; blackish, scarcely æneous; appendages testaceous. Head with front shining, not alutaceous; mandibular scrobes short. Prothorax about a half wider than long (by measurement), rather strongly narrowed posteriorly; basal angles obtuse, rather narrowly

rounded; longitudinal impressed line fine but distinct, transverse lines obsolete; disk faintly alutaceous only in region of basal foveæ, which are impunctate. Elytra with humeri not strongly angulate; striæ moderate, impunctate except for small serial punctures on second, fifth, and seventh; scutellar stria practically absent; margin slightly sinuate near apex; intervals alutaceous, glabrous. Apex of prosternum not margined. Hind tarsi slender. Male with front and middle tarsi slightly dilated and biseriately squamulose below. Length 4½ mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19523) from Coamo Springs, Puerto Rico, Sept. 28, 1929, S. T. Danforth; unique.

This species somewhat resembles a small *S. sinuatus* (Gyll.), but has much less incised elytral apices, better defined angles of prothorax, and differs in other ways.

81. **Selenophorus solitarius** n. sp.

Moderately stout and convex; greenish or æneous black, nor iridescent; appendages testaceous. Head with front impunctate, not distinctly alutaceous (except faintly posteriorly); mandibular scrobes short. Prothorax about a half wider than long (by measurement), rather strongly narrowed behind; basal angles broadly rounded; median longitudinal line distinct, anterior transverse impression faint, posterior absent; disk moderately convex, rather shining; basal foveæ alutaceous and rather closely and coarsely punctate. Elytra with humeri angulate; striæ moderate, not punctate except for moderate serial punctures on usual striæ; scutellar stria present; margin broadly, moderately sinuate near apex; intervals alutaceous, glabrous. Apex of prosternum not margined. Posterior tarsi rather long. Male with front and middle tarsi slightly dilated and biseriately squamulose. Length ±5½ mm.

Holotype ♂ (American Museum) from Zaza del Medio, Cuba, Sept. 3, 1913; 1 ♀ paratype (United States National Museum) from Cayamas, Sta. Clara, Cuba, Jan. 14, E. A. Schwarz.

Superficially this species is rather like a small, stout *beauvoisi* Dej., but is easily separable as shown in the key.

Selenophorus haitianus n. sp.

Not especially broad, but very convex; piceous without distinct metallic or iridescent lustre; appendages testaceous. Head with front impunctate, very shining; mandibular scrobes short. Prothorax slightly less than a half wider than long (by measurement), rather strongly narrowed posteriorly; basal angles obtuse, narrowly rounded; median impressed line fine but distinct, transverse impressions obsolete; disk convex, very shining; base, especially basal foveæ, rather finely and closely punctate (punctures fainter at middle of base.) Elytra with humeri angulate; striæ moderately impressed, impunctate except for usual small serial punctures; scutellar stria present; margin moderately sinuate near apex; intervals alutaceous, glabrous. Apex of pronotum not margined. Hind tarsi long. Length ±5 mm.

Holotype ♀ (Museum of Comparative Zoölogy no. 19524) from Manneville, Haiti, W. M. Mann; 1 ♀ paratype (American Museum) from Pont Beudet, Haiti, March 3-4, 1922, altitude about 100 ft.

As compared with its closest relatives, which seem to be *latior* and *parvus,* this species differs not only as shown in the key, but in its much more convex and more shining (though not metallic) anterior parts.

82. **Selenophorus chalybeus** Dej.

Selenophorus cyaneopacus n. sp.

Subdepressed; bluish or purplish black, dull, not shining; legs piceous; labrum, palpi, and antennæ rufo-piceous to rufous. Head: mandibular scrobe reaching about to apex of labrum; labrum very deeply emarginate in front; bottom of emargination would be acute if angle were not narrowly rounded; antennæ moderate, not quite reaching base of prothorax; front finely alutaceous. Prothorax large, just under a half wider than long, subquadrate, slightly narrowed behind; basal angles broadly rounded; margin rather strong at sides, less so basally; disk finely alutaceous, depressed

near basal angles, base finely and inconspicuously wrinkled, not obviously punctate. Elytra finely striate, striæ not distinctly punctate except for minute serial punctures on second, fifth, and seventh; scutellar stria rather long; intervals flat, alutaceous, but without evident punctuation; humeri distinct; subapical sinuation of margin slight. Posterior tarsi long. Prosternum not margined at apex. Male with front tarsi rather narrow; first joint longer but not wider than second, spinulose but not squamulose beneath; joints two to four distinctly but narrowly squamulose; middle tarsi almost without sexual clothing; hind tibiæ straight; middle tibiæ nearly straight, only slightly arcuate. Length 11½ mm.

Haiti: holotype ♂ (Museum of Comparative Zoölogy no. 19526) from Cap Haitien, W. M. Mann; 3 paratypes (♂ ♀ ♀) from Jean Rabel, Feb., E. C. & G. M. Leonard (United States National Museum); 1 ♀ paratype from Port-au-Prince, Aug., G. N. Wolcott (U. S. N. M.).

The outstanding structural characters of this Selenophorus are the deep emargination of the labrum, deeper than in any other species I have seen, and the reduced squamulation of the male tarsi. The emargination of the labrum is said by Putzeys (Ent. Zeit. Stettiner 1878, Vol. 39, p. 4) to be variable in this genus and to reach its greatest development in *S. batesi* Putz., which is otherwise quite different from the present species. Bates, in "Biologia" (p. 274), under *S. hepburni,* comments on the reduction of the squammules of the male tarsi in some Selenophorus. He found the character usually associated with arcuation of the male middle tibiæ, but in the present species the tibiæ are no more arcuate than in *S. chalybeus* Dej. The new species probably has a superficial resemblence to *anceps* Putz. and *opacus* Putz., of the Argentine and Brazil respectively, and to one or two other species, but differs, to judge from descriptions, not only in minor details but in having the labrum much more emarginate. It is a rather atypical Selenophorus, but cannot be referred to any other genus at present described.

Selenophorus latior n. sp.

Rather stout, not especially convex; brownish black, not iridescent and without evident metallic lustre; appendages rufo-testaceous, antennæ darker. Head with front impunctate but finely alutaceous; madibular scrobes short. Prothorax about a half wider than long (by measurement), scarcely narrowed posteriorly, so that it appears unusually wide; basal angles rounded but not especially broadly so; median line distinct, transverse impressions obsolete; disk alutaceous, more obviously so in basal foveæ, in which there are very indistinct traces of punctuation. Elytra with humeri angulate; striæ moderate, inpunctate except for rather small serial punctures on usual striæ; scutellar stria present; margin only slightly sinuate before apex; intervals alutaceous, glabrous. Apex of prosternum not margined. Hind tarsi rather long. Male with front and middle tarsi moderately dilated and biseriately squamulose below. Length ±6 mm.

Holotype ♂ (American Museum) from Haina, Santo Domingo, G. N. Wolcott; 1 ♀ paratype (United States National Museum) from Pt. Congrejos, Puerto Rico, Feb. 8, 1920, G. N. Wolcott.

This species is easily recognized by the unusual width of the prothorax at base, as well as by other characters given in the key.

Selenophorus nonseriatus n. sp.

Convex, glabrous, shining; blackish, with more or less strong elytral iridescence; appendages, labrum, and tip of last ventral testaceous; mandibles, elytral suture and lateral margins (very narrowly) somewhat rufescent. Head shining, finely bi-impressed in front; antennæ rather stout; mandibular scrobes moderate. Prothorax subcordate, about a half wider than long; sides rounded anteriorly, broadly but slightly sinuate before the obtuse but distinct basal angles; lateral margin narrow; disk with transverse impressions and basal foveæ vague, median line distinct, surface impunctate. Elytra with striæ entire, moderately deep, faint-

ly irregular but not distinctly punctate; humeri subangulate; margin near apex barely sinuate; serial punctures of second, fifth, and seventh striæ absent. Prosternum not margined. Male front and middle tarsi slightly dilated, biseriately squammulose; first joint of front tarsus not larger than second; hind tarsi short, joints three and four scarcely or not longer than wide. Last ventral narrowly emarginate at apex (♂) or not (♀), also sinuately emarginate each side (both sexes). Length ±5½ mm.

Holotype ♂ (United States National Museum) and 2 (♀ ♀) paratypes (1 in Museum of Comparative Zoölogy, no. 19528) from San Francisco Mts., Santo Domingo, Sept. 14 and "Sept.", A. Busck; 1 ♂ paratype from Claremont, Jamaica, March 14 (American Museum).

The genus to which this species should be referred is doubtful. However, it is a nearly typical Selenophorus except for the absence of the usual series of elytral punctures, and it seems better to place it in this genus temporarily rather than to describe a new genus in this difficult tribe without a complete generic revision. Superficially, except for its completely striate elytra, the new species rather resembles *Bradycellus obsoletus* Say of Mexico, but it differs greatly in microscopic structure.

83. **Bradycellus (Stenocellus) festinans** Csy.

84. **Bradycellus (Stenocellus) cubanus** n. sp.

Elongate, not very convex (about as in *Stenocellus rupestris* Say); irregular rufous to rufescent piceous, suture and outer margins of elytra paler; legs and mouth parts testaceous; antennæ brown with two basal joints paler. Head rather short and broad, eyes rather prominent; front normal for *rupestris* group, indistinctly bifoveate between anterior edges of eyes, with a short, oblique impressed line from inner edge of eye to fovea; front also with median puncture; mentum toothed. Prothorax about three tenths wider than long, narrowed behind, with basal angles very obtuse and not even minutely prominent, but not rounded; disk with strong median longitudinal and subobsolete transverse impressions; basal foveæ broad and shallow, finely

alutaceous and with numerous rather coarse punctures. Elytra subparallel, evenly conjointly rounded at apex; striæ entire, moderately impressed, impunctate; no scutellar stria; intervals slightly convex, very shining, without trace of alutaceous microsculpture; one dorsal puncture on each third interval about a third from apex. Male tarsi slightly dilated, sparingly biseriately squamulose below. Length 3½-4½ mm.

Holotype ♂ (United States National Museum) from Cayamas, Sta. Clara, Cuba, Dec. 26, E. A. Schwarz; 1 ♀ paratype (Museum of Comparative Zoölogy no. 19529) from the same locality, Baker; 1 ♀ paratype from Cumanayagua, Cuba, June 13, F. de Zayas (collection Estación E. Agronómica, Cuba); 1 specimen in poor condition from Cuba, Poey Collection no. 569 (Philadelphia Academy of Sciences).

This species belongs to the difficult *rupestris* group of Stenocellus. It differs from *rupestris* and the latter's closest relatives in having the basal angles of the prothorax not minutely prominent; from *congener* Lec., *nubifer* Lec., *ventralis* Lec. (types of all three seen), and *flohri* Bates (series seen) in lacking the fine, transverse, alutaceous microsculpture of the elytra; and from *festinans* Csy. in being broader, less convex, with shallower elytral striæ and less rounded prothoracic angles.

The presence or absence of microsculpture on the elytra is apparently a constant specific character in this genus. For instance, it is uniformly present in a series of 26 specimens of *congener* Lec. from Brownsville, Tex., is uniformly present also in the 9 specimens of the following new species, and is uniformly undetectable in a series of 8 specimens of the Mexican *nigrellus* Bates which I have seen. I do not know of any species in which the sculpture varies in specimens from a single locality.

85. **Bradycellus (Stenocellus) velatus** n. sp.

Piceous, more rufescent below; suture and mouth always and base of elytra and humeri and (vaguely) prothorax sometimes rufescent; apex and side margins of elytra posteriorly and epipleuræ and side margins of prothorax below

more or less testaceous; appendages pale testaceous. Head with a deep, oblique impressed line running forward from the inner margin of each eye; eyes rather prominent; front faintly alutaceous, with faint puncture at middle; mentum toothed. Prothorax rather subcordate, about a quarter wider than long; basal angles obtuse but distinct, preceded by a slight sinuation of the sides; basal foveæ broad and vague, distinctly but variably punctate; disk with median line distinct, transverse impressions sub-obsolete, surface with faint silky alutaceous lustre. Elytra parallel, evenly conjointly rounded at apex; scutellar stria absent, striation otherwise complete, regular, impunctate; intervals slightly convex, faintly alutaceous, third with a puncture near second stria behind middle. Male tarsi scarcely dilated, with scanty biseriate squamulation. Length ± 3 mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19530) and 8 paratypes from Soledad (near Cienfuegos) Cuba, June, Oct. 25-Nov. 23, some taken in flood debris; 1 specimen in poor condition from Cuba, Poey Collection no. 597 (Philadelphia Academy of Sciences); 2 paratypes from Rio Piedras, Puerto Rico, Sept. 8 and July, coll. by Alsina (1 returned to S. T. Danforth).

This species is very similar to *Bradycellus tantillus* (Dej.) of the United States, but differs (as shown by comparison with specimens of *tantillus* in the Leconte Collection and with a series from Florida in my own collection) in being slightly broader, less shining, and with better defined posterior thoracic angles. It is even closer to *B. nigrellus* Bates of Mexico and Guatemala, of which there is a series of cotypes in the Museum of Comparative Zoölogy, but differs in its uniformly duller lustre.

86. **Acupalpus (Stenolophus) ochropezus** (Say).

87. **Acupalpus (Stenolophus) convexulus** n. sp.

Convex, moderately shining; nearly uniform piceous black; mouth parts, two basal joints of antennæ, and legs testaceous; outer joints of antennæ (last four missing) brown. Head short, broad, with moderately prominent eyes,

frontal sulci subobsolete; front with distinct median puncture; mentum without tooth. Prothorax very convex, not depressed at sides, just over a third wider than long (by measurement); lateral margins narrow; basal angles strongly but somewhat obtusely rounded; disk with impressed lines faint; basal foveæ vague and shallow, impunctate. Elytra convex, rather short, subparallel, evenly conjointly rounded apically; striæ rather fine, impunctate; scutellar stria moderately long, slightly impressed; intervals faintly convex; one discal puncture nearly on second stria about a fourth from apex. Length 3½ mm.

Holotype ♀ (United States National Museum) from Baraguá, Camagüey, Cuba, June 5, 1932, at light, L. D. Christenson; unique.

Without the male it is impossible to be absolutely sure of the genus in which this species should be placed, but all nonsexual characters as well as the general appearance of the insect are as in Stenolophus. Among the North American species of the latter, the Cuban one is most like *conjunctus* (Say) but is much more convex, with a more transverse, differently shaped prothorax.

88. **Agonoderus infuscatus** Dej.

89. **Masoreus (Macracanthus) brevicillus** Chev.
brevicollis Leng & Mutchler (err.)

90. **Masoreus (Aephnidius) ciliatus** Mutchler (Pl. 5, fig. 9)

This species is described in a supplement (p. 130) following the present paper.

91. **Lebia bitæniata** Chev.

92. **Lebia cyanea** Dej.
pleurodera Chd.

93. **Lebia viridis** Say
cyanea Chd., not Dej.

94. **Lebia collaris** Dej.

95. **Lebia (Dianchomena) abdominalis** Chd.

96. **Lebia (Dianchomena) solea** Hentz

97. **Gallerucidia dimidiata** Chd.

This species, which was described from Cuba, is unknown to me.

98. **Phloeoxena plagiata** n. sp.

Form nearly as in following species (see fig.), very broad, depressed; head and thorax piceous black, moderately shining, but with surface finely reticulate; elytra very dull opaque blackish with narrow lateral margin and large, regular, transversely oval spot extending from near middle to near apex, and laterally to the sixth striæ, rufo-testaceous; lower surface piceous except metasterna and abdomen rufo-testaceous, latter with narrow black margin; appendages rufo-testaceous. Head bi-impressed anteriorly, front with a median longitudinal puncture. Prothorax between three and four tenths wider than long; side margins rather narrow anteriorly, slightly broader posteriorly; basal angles would be right except are narrowly rounded; foveæ in angles very broad and indistinct, more alutaceous than pronotal disk. Elytra with curiously broad, shallow striæ, much as in *P. signata* (Dej.) but even less distinct; intervals slightly convex, united and slightly more prominent at apex as usual in genus; sinuation of apex less pronounced than in *signata;* each elytron with an ocellate puncture at extreme base of second stria, also with three dorsal setigerous punctures, the first on the third stria about a sixth from base, second and third on second stria before apical third and near apex. Length just under 5 mm.

Holotype ♂ (American Museum) a unique from Guantánamo, Cuba, March 3, 1914, taken in a tree, C. T. Ramsden.

The simply plagiate color pattern of this species is unique in the genus, except for the following new species.

99. **Phloeoxena imitatrix** n. sp. (Pl. 5, fig. 10.)

Superficially almost exactly similar to *plagiata* (above), which it resembles in color except that the elytral macula is smaller and the ventral surface rufous to rufo-piceous.

Structurally, *imitatrix* differs in having the prothorax slightly narrower, about a fourth wider than long (by measurement), with sides of base more oblique and posterior angles more obtuse, though preceded by a slight sinuation of the sides; in having the humeri more evenly rounded; in having the elytral striæ practically obliterated, faintly indicated only in favorable light; and in lacking the anterior dorsal puncture of each elytron. The position of the puncture (about a fifth from base) is usually indicated by a faint, broad, indefinite, unpunctiform impression, without a seta. The extreme basal ocellate puncture and the two posterior pairs of setigerous punctures, about a fourth and a twelfth from apex, are present. Length ±4½-5 mm.

Holotype ♂ (United States National Museum) and 2 (♀ ♀) paratypes (1 in Museum of Comparative Zoölogy, no. 19531) from Cayamas, Sta. Clara, Cuba, March 3, E. A. Schwarz; 1 paratype from Cuba, Poey Collection no. 954 (Philadelphia Academy of Sciences).

The color pattern at once distinguishes this species from all previously known ones except the preceding.

100. **Phloeoxena schwarzi** n. sp.

Broad, but less so than the two preceding species; depressed; piceous black, head and prothorax slightly shining but with reticulate microsculpture; elytra duller, opaque; below piceous, rufescent medially; appendages testaceous. Head bi-impressed anteriorly, front with median impression or puncture. Prothorax subquadrate, a quarter to a third wider than long (by measurement), sides slightly sinuate before the posterior angles, which would be right except are narrowly rounded; side margins narrow anteriorly, broader posteriorly; basal foveæ broad but poorly defined. Elytra visibly but very shallowly striate; striæ formed as usual in genus by slight, broad undulations of the surface; each elytron with three dorsal punctures as in *plagiata*. Length ±4½-5 mm.

Holotype ♂ (United States National Museum) and 3 (♂ ♀ ♀) paratypes (pair in Museum of Comparative

Zoölogy, no. 19532) from Cayamas, Sta. Clara, Cuba, Jan. 17, Mar. 8 & 9., E. A. Schwarz.

The lack of plagiation and the narrower form distinguish this species from the two described above; the striation of the elytra is intermediate; the form of the prothorax and presence of anterior dorsal puncture of elytra are as in *plagiata*. Of other described species this is apparently close only to *unicolor* Chd. of Mexico, which is described as having the antennæ brown with pale bases and the legs brown with reddish articulations. Antennæ and legs are clear testaceous in the Cuban species.

101. **Coptodera festiva** Dej.

102. **Coptodera unicolor** Chd.

103. **Microlestes poeyi** (J.-Duv.)

104. **Apristus sericeus** n. sp.

Piceous, silvery æneous above, appendages piceous; upper surface very heavily alutaceous, lower surface less so. Prothorax about a third wider than long (by measurement), much narrowed behind; sides sinuate before the almost right but only slightly prominent basal angles. Elytra with striæ almost entire but very broad and shallow, faintly irregular but not punctate; third stria with two large and conspicuous impressions, just before middle and near apical fourth. Length $\pm 3\frac{1}{2}$ mm.

Holotype (Museum of Comparative Zoölogy no. 19533) and 7 paratypes from Soledad (near Cienfuegos) Cuba, Oct. 19, Dec. 3; all taken running on dry sand in the sun on the banks of the Arimao River.

This species may be distinguished from all other American Apristus by its shallow elytral striæ combined with very heavily alutaceous surface. The species is apparently unique also in the large size of the dorsal punctures of the elytra. The genus has not been known before from the West Indies.

105. **Callida rubricollis** Dej.
elegans Chd.

106. Callida tinctula n. sp.

Small, elytra unusually broad for genus; head and prothorax brownish rufous; elytra rufescent with dull green lustre, brighter laterally; appendages testaceous. Head with prominent eyes; front smooth, except slightly alutaceous anteriorly, with large median puncture, and with slight longitudinal strigulation at sides in front of eyes. Prothorax less than a fourth wider than long, subcordate; posterior angles right, very minutely rounded; lateral margins moderate; median impressed line strong, anterior transverse impression obsolete, posterior distinct but not strong; disk moderately transversely wrinkled, irregularly and sparsely punctate near base and apex and beside middle line. Elytra rather broad but subparallel; independently emarginate-truncate at apex, with outer angle rounded; striæ moderate, punctulate; intervals barely convex, dull and alutaceous; third interval tripunctate. Inner wings fully developed. Mesosternum not tuberculate between coxæ. Lobes of fourth tarsal joints oval, slightly narrowed at base. Last ventral of female quadripunctate each side, broadly truncate apically, slightly sinuate each side. Length 5½ mm.

Holotype ♀ (United States National Museum) from Cayamas, Sta. Clara, Cuba, Feb. 2, E. A. Schwarz; unique.

This species is generally similar to *Callida decolor* Chd., described from Martinique and seen by me from Haiti, and will probably prove to have similar male tarsal squammulation, with small squammules on the first three joints of the middle tarsi. It differs from *decolor* in being smaller, with elytra submetallic, and with the prothorax narrow and with relatively narrower margins. It is apparently not at all close to anything known from Central America.

107. Plochionus (s. s.) pallens (Fab.)

108. Plochionus (Menidius) bicolor Notman

109. Andrewesella (Euproctus) trivittata (Lec.)

110. Apenes coriacea (Chev.)

111. **Apenes sulcicollis** (J.-Duv.)

112. **Apenes parallela** (Dej.)

113. **Apenes (s. s.) delicata** n. sp.

Form as usual in *sinuata* group; rather broad, depressed; æneous black with more or less piceous tinge; elytra each with humeral spot (extending inward to about fifth stria, back about a fifth of elytral length) and together with a rather broad, undulate transverse supapical fascia yellow; appendages brownish yellow. Head with front not distinctly alutaceous, very finely and sparsely punctate, not strigulose; antennæ short, middle joints scarcely longer than wide. Prothorax about a third wider than long (by measurement) subcordate; sides briefly sinuate before the basal angles, which are minutely almost right; disk alutaceous and with very fine sparse punctuation and indistinct transverse strigulation. Elytra with striæ moderate, not punctate; scutellar stria long; intervals flat or (externally) slightly convex, heavily alutaceous; third interval with two rather broadly but shallowly impressed setigerous punctures about a fourth from base and near middle. Length ±5-5½ mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19534) and 3 paratypes from Soledad (near Cienfuegos) Cuba, June 27 (G. Salt), Oct. 18-Nov. 7; 3 paratypes (United States National Museum) from Cayamas, Sta. Clara, Cuba, Mar. 15, May 20, and Dec. 26, E. A. Schwarz; 1 paratype from Cuba, Poey Collection no. 822 (Philadelphia Academy of Sciences). One of my specimens was taken by sifting in woodland, another in a flooded plowed field.

This species is near *sinuata* Say of the United States, but is smaller, with head much less punctate. It answers rather well to the description of *lunulata* Chd. of Yucatan, but M. René Oberthür, who has been kind enough to compare a specimen of the Cuban species with Chaudoir's type, writes that the latter is considerably larger, with a broader thorax and more elongate humeral mark.

114. Apenes lata n. sp.

Also of the *sinuata* group, and so similar to the preceding (*delicata*) that a brief comparison will be sufficient for description. The form of *lata* is relatively broader; color, sculpture, and marking similar. Prothorax much broader, a half or more wider than long (by measurement). Size larger, ±7-8 mm.

Holotype ♂ (American Museum) and 2 paratypes (1 in Museum of Comparative Zoölogy, no. 19535) from Mangrove Cay, Andros Island, Bahamas, May-June, 1917, W. M. Mann. I have also seen a specimen from Soledad (near Cienfuegos) Cuba, July 1, B. B. Leavitt, but the specimen is not at present available for description.

A specimen of this species also has been sent to M. Oberthür, who finds it different from anything in his collection. I had thought from Chaudoir's description that it might be *fasciata,* described without locality, but M. Oberthür writes that the type of *fasciata* has a more cordiform prothorax, and that the West Indian species is perfectly distinct.

Apenes lævicincta n. sp.

Form of *sinuata* group; head and prothorax æneous rufopiceous, ground color of elytra nearly same; elytra each with humerus, a fragmentary oblique fascia at basal third, narrow lateral margin, and common subapical transverse fascia testaceous, also with a slightly oblique transverse shining black fascia common to both elytra just in front of subapical testaceous mark, also with faint dark spotting around anterior oblique fascia and on the ninth interval; lower surface mostly piceous, appendages and middle of abdomen rufous or testaceous, base of femora slightly infuscate. Head alutaceous and finely and sparsely punctate, not strigulose; antennæ short, middle joints about as wide as long. Prothorax transverse, nearly a half wider than long (by measurement), subcordate; sides briefly sinuate before basal angles, which are minutely almost right; disk alutaceous and with fine sparse punctuation and indistinct transverse strigulation. Elytra finely striate, striæ finely punc-

tulate, scutellar stria long; intervals nearly flat, alutaceous except in transverse black fascia which is smooth and shining, third interval with two broadly impressed punctures almost on second stria (relation to striæ probably variable) about a fourth from base and near middle. Length just over 5 mm.

Holotype ♂ (American Museum) unique, from Port-au-Prince, Haiti, about 300 ft. altitude, Apr. 8-11, 1922.

This species is at once distinguishable from all others of the *sinuata* group, including the two described above, and I think from all other Apenes too, by the black, shining fascia just preceding the subapical testaceous one. The alutaceous head and punctulate elytral striæ further differentiate this species from the two preceding.

115. **Eucærus insularis** n. sp.

Stout, convex; piceous, elytra with iridescent lustre; antennæ with first six joints brown, seventh vaguely bicolored, outer joints whitish; palpi and legs irregular brownish yellow, posterior femora darker. Head alutaceous, antennæ relatively stout, middle joints about three times as long as wide. Prothorax cordate, about four tenths wider than long (by measurement), sides sinuate before the obtuse but distinct posterior angles; disk alutaceous. Elytra shining, striæ rather fine, entire, not punctate; intervals barely convex; third stria with inconspicuous setigerous puncture about a fourth from base, second stria with similar punctures near middle and about a fifth from apex. Inner wings vestigial. Male with one, female with two setæ each side last ventral. Length $\pm 3\frac{1}{2}$ mm.

Holotype ♀ (Museum of Comparative Zoölogy no. 19536) from Soledad (near Cienfuegos) Cuba, June, probably taken in flood debris; 3 paratypes (United States National Museum) (♂ ♀ ♀) from Cayamas, Sta. Clara, Cuba, Jan. 17 and Mar. 11, E. A. Schwarz.

This species is very close to *Eucærus varicornis* Lec., of which I have seen nine specimens, including the type, from South Carolina, Georgia, Florida, Alabama, and Louisiana, but differs in having the antennæ slightly stouter, the

posterior angles of the prothorax more distinct, and the color darker. The genus has not been known before from the West Indies.

116. **Pentagonica flavipes** (Lec.)

117. **Pentagonica nigricornis** n. sp.
bicolor (Gundlach) (Rhombodera), not Lec.

Form as usual in Pentagonica; surface alutaceous, slightly shining; black; entire prothorax, narrow reflexed margins of elytra, and legs yellow; palpi brown; antennæ entirely black. Prothorax slightly wider than in *flavipes,* eight or nine tenths wider than long. Elytra moderately striate, striæ irregularly subpunctate; intervals slightly convex. Length ±4-5 mm.

Holotype (Museum of Comparative Zoölogy no. 19537) and 2 paratypes from Soledad (near Cienfuegos) Cuba, Nov. 1 & 2; all from flood debris.

This differs from all previously described New World Pentagonica in type of coloration combined with uniformly black antennæ. It resembles *picticornis* Bates of Guatemala except that the antennæ (of *nigricornis*) are not bicolored and there is less yellow on the lateral margins of the elytra. Gundlach's notes under "Rhombodera bicolor" show that he really had this species before him.

Pentagonica divisa n. sp.
atrorufa (Gundlach) (1893, An. Soc. Espanola H. N. 22, p. 292; Rhombodera), not Reiche.
bicolor (Leng & Mutch.) (1917, Bull. American Mus. N. H. 37, p. 195), not Lec

Form as usual in genus; head and prothorax above and below yellow testaceous, prothorax above with sides (but not margins) anteriorly faintly dusky to more or less strongly infuscate; elytra dull black with narrow pale outer margins; hind body piceous below; antennæ testaceous with first joint commonly and next three rarely slightly darker; legs testaceous. Head and prothorax as usual in genus; alu-

taceous; prothorax seven or eight tenths wider than long. Elytra unusually deeply striate. Length ±4-4½ mm.

Puerto Rico: holotype (Museum of Comparative Zoölogy no. 19538) from Yauco, F. Delgado: paratypes from Mayagüez, S. Vicks; Jayuya, C. Gonzales; Aguada, G. Lopez; and Boquerón, F. Mora; all December (collection of S. T. Danforth and M. C. Z.); Bayamon, May 14, at light (United States National Museum).

This species resembles *atrorufa* Reiche (Brazil), *bicolor* Lec. (United States), and *semifulva* Bates (Central America) in color, but differs from all of them in having testaceous, not dusky, antennæ, and from the last two at least, in having deeper elytral striæ.

118. **Colliuris (Odacanthella) picta extrema** Liebke
picta (Gundlach), not Chd.

118-a. **C. (O.) p. suturalis** (Chd.)
concluda Liebke.

The American Museum possesses one specimen each of *suturalis* Chd. and *concluda* Liebke, the latter differing from the former only in that the subapical red spots of the elytra are connected across the suture. These specimens were evidently taken together, "at the foot of a *Jatia* fence post," between Manati and Los Canos, Guantánamo, Cuba, July 27, C. T. Ramsden. It does not seem to me worth while to recognize and name color forms of species of beetles when, as in this case, color has no geographical significance, so I suggest that *concluda* be reduced to synonymy. The entirely unspotted form (*extrema* Liebke) may possibly have geographical standing in Cuba, so it may stand for the present.

119. **Colliuris (Odacanthella) gundlachi** n. sp.

Elongate; piceous, elytra translucent apically, each with a conspicuous subapical red spot and rarely a rather small reddish mark about a third from base near outer margin; antennæ brownish, joints two and three vaguely more rufescent; middle and hind tibiæ more or less spotted or banded with whitish beyond the middle; femora pale bas-

ally, brown apically. Head: front smooth. Prothorax about two and four tenths as long as greatest width, with usual median line, with faint traces of transverse rugæ only basally, otherwise smooth; anterior angles not at all produced. Elytra with striæ almost obliterated even in basal third, where only indistinct traces of punctate striation are visible; outer apical angles approximately right; apex sinuato-truncate. Length 6½-8 mm.

Holotype (Museum of Comparative Zoölogy no. 19539) and 34 paratypes from Soledad (near Cienfuegos) Cuba, June, Oct. 19-Nov. 7; taken in a variety of damp places.

In Liebke's recent key of Odacanthella (1930, Mitt. Zool. Mus. Berlin 15, pp. 658 -) this species runs to *portoricensis* Liebke, differing from *tetrastigma* Chd. and *lioptera* Bates in its nearly uniformly colored antennæ. From *portoricensis*, which I have seen from Puerto Rico and Haiti, *gundlachi* differs in its maculate tibiæ, slightly smaller size, and more nearly complete obliteration of the rugæ of the prothorax and the striæ of the elytra.

120. **Colliuris (Pseudocasnonia) noah** n. sp. (Pl. 5, fig. 11.)

Small, slender, convex; shining piceous, elytra sometimes speckled with black in strong light; appendages and narrow elytral margin pale testaceous. Head short; sharply, obliquely constricted behind the eyes; front smooth and shining. Prothorax rather short, slightly less than twice as long as wide, truncate anteriorly, anterior angles not at all produced; disk faintly, transversely rugose, shining and impunctate except in basal and apical transverse impressions, with distinct median longitudinal impressed line; side margins each with a single setigerous puncture just before middle. Elytra narrow, only slightly dilated behind the middle, lateral margins narrow; apices sinuato-truncate, outer apical angles obtuse, narrowly rounded; elytral surface entirely shining, not alutaceous; marginal stria deep, inner impressed striæ nearly or entirely absent, but several striæ indicated by rows of widely spaced punctures in basal third of elytron; third interval with about five, fifth and seventh with fewer, setigerous punctures. Length ±5 mm.

Holotype (Museum of Comparative Zoölogy no. 19540) and 2 paratypes from Soledad (near Cienfuegos) Cuba, Oct. 21; all taken in floating debris during a very heavy flood.

In Liebke's table of Pseudocasnonia (*l. c.*, 664 -) this species runs to *signata* Chd. which, however, has the elytra strongly ridged, not smooth as in *noah*. So far as I can find, the latter has no really close relatives.

121. **Leptotrachelus dorsalis** (Fab.)

I have seen no Cuban specimen of this species, which is recorded by Gundlach, however.

122. **Galerita tenebricosa** Klug.
vetula Chev.

123. **Galerita ruficollis** Dej.
erythrodera Brullé
insularis Cast.
thoracica Chev.

Galerita microcostata n. sp.

Moderately stout for genus; black, head with two small red spots between eyes, tibiæ and tarsi piceous, antennæ brownish rufous. Head rather large, with sides angulate, not directly narrowed, behind eyes; front coarsely punctate. Prothorax subquadrate, very slightly wider than long (by measurement); sides broadly sinuate before basal angles, which would be right except are narrowly rounded; disk closely punctate, median line very fine, transverse impressions sub-obsolete. Elytra very slightly narrowed basally, humeri rather distinct; each elytron with nine pairs of fine longitudinal costæ, with unpaired intermediate costæ developed externally but obsolete near suture. Inner wings present. Length 15½ mm.

Holotype ♂ (Museum of Comparative Zoölogy no. 19541) from Mayagüez, Puerto Rico, May 12, 1932, E. Figarella, received from S. T. Danforth; unique.

This species is a close relative of *Galerita americana* (L.) of South America and the Lesser Antilles (I have seen

nine specimens from Guadeloupe), but has the prothorax and appendages dark and the inner unpaired costæ of the elytra obsolete, not conspicuous as in *americana*. The two species are very similar in form.

Key to the West Indian Species of Pseudaptinus

Since I am describing several new species of Pseudaptinus and recording others from the West Indies for the first time, it seems best to publish the following key:

1. Posterior angles of prothorax basal, not prominent ..... (Pseudaptinus *s. s.*) 2

   Posterior angles of prothorax before base, minutely prominent (subgenus Thalpius) 4

2. Body irregular testaceous and brown, head black; antennæ not sharply bicolored; length just under 5 mm..... *apicalis* n. sp.

   Uniform piceous or black; antennæ sharply bicolored; length 5-6 mm..... 3

3. Side margins of prothorax distinct ...*marginicollis* n. sp.
   Side margins of prothorax obsolete .....*thaxteri* n. sp.

4. Body bicolored, black or brown with rufous prothorax; punctuation rather fine and close; ±5 mm..... *insularis* Mutchler

   Not bicolored; punctuation variable..... 5

5. Pinkish brown, upper surface opaque, finely and very closely punctate; ±5½ mm.....*cubanus* Chd.

   Rufous, plain brown, or black; rather closely but more coarsely punctate, surface of head and thorax rather shining between punctures 6

6. Antennæ slender, middle joints about twice as long as wide; elytra usually with a vague post-median dark area..... *dorsalis* Brullé

   Antennæ stout, middle joints scarcely longer than wide. 7

7. Elytral striæ rather irregularly but seriately punctate except apically, the punctures much coarser than those minutely prominent.....*pygmæus* Dej.
   Elytral striæ not evidently seriately punctate, not more coarsely punctate than intervals; prothorax broader, basal angles more broadly prominent.....*deceptor* n. sp.

124. **Pseudaptinus (s. s.) apicalis** n. sp.

Convex, rather elongate, finely pubescent; head piceous black; prothorax rufo-testaceous; elytra brown, vaguely paler near suture anteriorly, with about apical fifth testaceous. Head: antennæ stout; eyes rather large and prominent; front finely alutaceous; moderately punctate. Prothorax convex, comparatively little dilated apically; side margins indistinct; disk rather shining, rather closely punctate, with distinct median line, without transverse rugæ. Elytra convex, deeply striate, striæ not punctate; intervals finely alutaceous; apices obliquely subtruncate, with outer angles broadly rounded. Length just under 5 mm.

Holotype (Museum of Comparative Zoölogy no. 19542) unique, from Soledad (near Cienfuegos) Cuba, Nov. 13.

Among described species this is close apparently only to *Pseudaptinus subfasciatus* Chd. of Brazil, which, however, has the elytra much more extensively pale. M. Oberthür has compared the Cuban specimen with Chaudoir's type and states that they are different species. From *S. leprieuri* (Buquet) of Cayenne, which must be superficially similar, *apicalis* differs in its non-rugose prothorax and in other ways.

125. **Pseudaptinus (s. s.) marginicollis** n. sp.

Elongate, rather convex, finely pubescent; dull piceous black, rufescent below; antennæ with three basal joints mostly black, fourth and fifth bicolored, outer joints whitish; palpi dark, tipped with whitish; legs testaceous. Head with eyes rather large and prominent; antennæ rather slender; front alutaceous, moderately punctate. Prothorax narrow, about a fifth longer than wide (by measurement),

but appearing longer, widest near the front; posterior angles not prominent; lateral margins distinct, narrowly raised; disk alutaceous, punctate like head, with distinct median impressed line abbreviated at base and apex. Elytra deeply, nearly evenly striate; striæ impunctate; intervals convex, alutaceous. Length 5-6 mm.

Holotype (Museum of Comparative Zoölogy no. 19543) and 9 paratypes from Soledad (near Cienfuegos) Cuba, Sept. 2 (B. B. Leavitt), June, Oct. 21, Nov. 7 & 9, most of the specimens from flood debris; 1 paratype from Baraguá, Cuba, Oct. 28, at light, L. C. Scaramuzza (United States National Museum).

This and the following species must be near *Pseudaptinus elegans* (Chd.) of Brazil, but are said by M. Oberthür, to whom I am indebted for comparisons of West Indian specimens with Chaudoir's type, to be distinct. I hope in my next paper to be able to publish the distinguishing characters. Both West Indian species, especially the one from Grenada (below) are near *Ps. lecontei* Dej. of the United States, too, but *lecontei*, of which I have seen several specimens, has the prothorax more dilated anteriorly and is more shining.

Pseudaptinus (s. s.) thaxteri n. sp.

Exceedingly similar to *marginicollis*. The preceding description may stand for the present species except that the side margins of the prothorax are obsolete and the color less contrasting. Length about 5 mm.

Holotype (Museum of Comparative Zoölogy no. 19544) and 1 paratype from Grand Etang, Grenada, R. Thaxter.

This species is, of course, named in honor of the collector, the late Professor Roland Thaxter.

126. **Pseudaptinus (Thalpius) cubanus** (Chd.)

127. **Pseudaptinus (Thalpius) insularis** Mutchler.

This species is described in the *American Museum* (New York) *Novitates* no. 686, 1934, p. 4.

128. **Pseudaptinus (Thalpius) pygmaeus** (Dej.)

129. **Pseudaptinus (Thalpius) dorsalis** Brullé.

130. **Pseudaptinus (Thalpius) deceptor** n. sp. (Pl. 5, fig. 12.)

Of average form for group; rufescent to piceous brown, appendages testaceous; entire dorsal surface finely pubescent, moderately punctate with punctures of average size; surface between punctures rather shining. Head with eyes large; antennæ short, middle joints scarcely longer than wide. Prothorax almost exactly as long as wide (by measurement), subcordate but broader at base than usual; subbasal denticles (basal angles) rather broad and conspicuous, but acute; lateral margins rather broad; disk not very convex, middle line distinct except near base and apex. Elytra rather shallowly striate, striæ not regularly punctate but with irregular punctuation like that of intervals; latter slightly convex, not rugulose. Length ±5-6 mm.

Holotype (Museum of Comparative Zoölogy no. 19545) and 55 paratypes from Soledad (near Cienfuegos) Cuba, June, Oct. 21-Nov. 7, mostly taken in flood debris.

The largest specimens of the series have the punctuation of the prothoracic episterna less developed than in smaller ones, but the variation is probably only individual. The distinguishing characters of the species are sufficiently given in the key.

131. **Zuphium cubanum** Liebke.

Described in *Revista Ent.*, 1933, Vol. 3, p. 470.

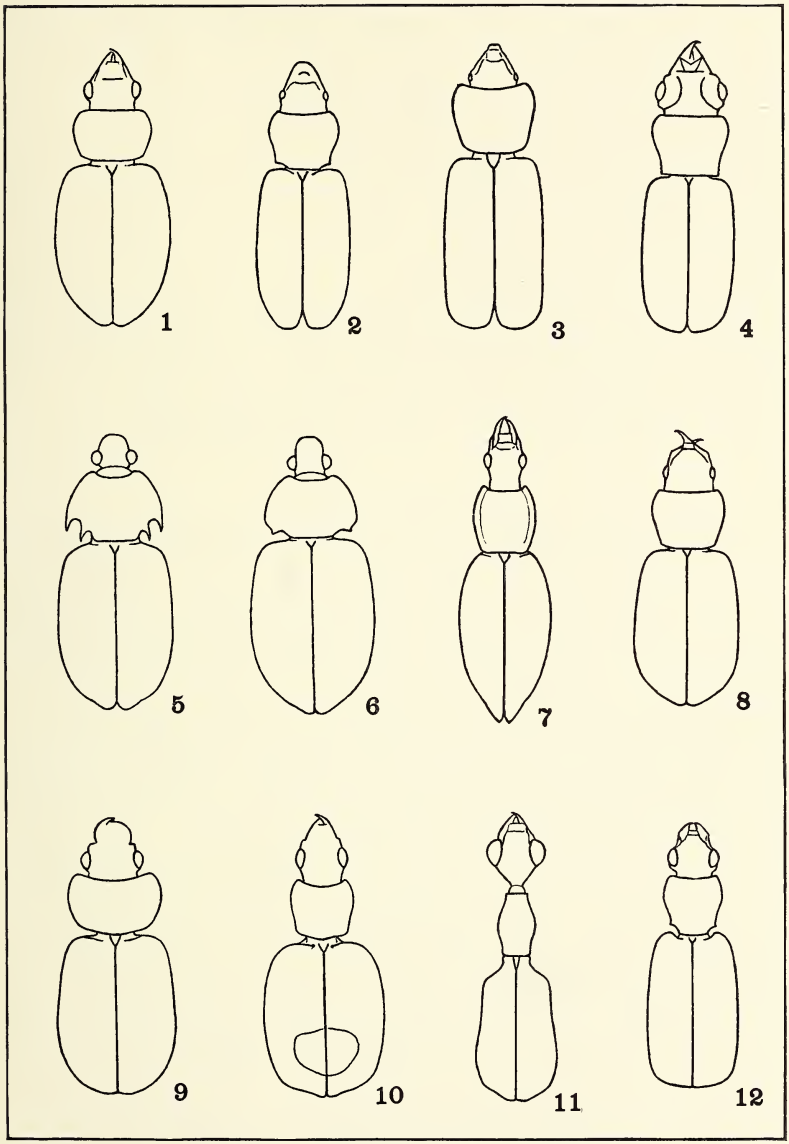
132. **Zuphium bierigi** Liebke.

Described in the same paper as the preceding, p. 467. I have not seen this species; all my Cuban Zuphium are certainly *cubanum*.

133. **Brachynus lateralis** Dej.

134. **Brachynus brunneus** Cast.

Psyche, 1934 Vol. 41, Plate 5



Darlington—West Indian Carabidæ

EXPLANATION OF PLATE

Outlines (from camera-lucida drawings) of head, prothorax, and elytra of

Fig. 1.—Tachys (s. s.) dominicanus n. sp.
Fig. 2.—Limnastis americanus n. sp.
Fig. 3.—Micratopus parviceps n. sp.
Fig. 4.—Perileptus columbus n. sp.
Fig. 5.—Coptia sauricollis n. sp.
Fig. 6.—Coptia effeminata n. sp.
Fig. 7.—Colpodes macer n. sp.
Fig. 8.—Perigona microps n. sp.
Fig. 9.—Masoreus (Aephnidius) ciliatus n. sp. (Mutchler.)
Fig. 10.—Phloeoxena imitatrix n. sp.
Fig. 11.—Colliuris (Pseudocasnonia) noah n. sp.
Fig. 12.—Pseudaptinus (Thalpius) deceptor n. sp.

SUPPLEMENT:

Masoreus (Aephnidius) ciliatus new species (Mutchler)
(Pl. 5, fig. 9)

Oblong oval, black, legs, antennæ and mouth parts testaceous. Head subquadrate, finely closely punctate; mandibles without setigerous punctures in the scrobes, sides elevated; basal joint of antennæ with a long bristle at apex; front of labrum slightly curved inwardly (almost straight) margin with setigerous punctures; clypeus with a puncture on each side. Pronotum subquadrate, one-third wider than long, wider than the head, widest at about the middle, apical angles narrowly rounded and slightly produced, lateral margin with a setigerous puncture on the apical third and another at the basal fifth, basal angles broadly rounded, marginal bead extending from the side of the insertion of the head to the scutellar area, a median longitudinal impressed line, somewhat well marked, extending from the apex to near the base, with indistinct oblique lines, extending backwards from this median line. Scutellum triangular, apex narrowly rounded. Elytra with humeral angles rounded margins not interrupted, surface (under high

power magnification) with indications of faint striæ and appearing as if covered with fine scales giving them a silky appearance, possibly granulate punctate, submargin with setigerous punctures, apical angles rounded. Front tibiæ with two elongate spines at upper end of the emargination (the outer one apparently bifid for about two-thirds its length), apical spine somewhat long; joints of the front tarsi shorter than those on the other legs, first joint slightly longer than the next two taken together and about as long as the apical joint, joints two, three and four gradually shorter, hind tarsi with the first joint slightly longer than the apical joint, other joints shorter, claws distinctly but shortly pectinate; hind tibiæ, with spines similar to those on the middle tibiæ, on the outer side. Length 4.5 mm.

Type. Ensenada, Puerto Rico, June 17 to 19, collected by Dr. F. E. Lutz, on the side hill back of Canary Cottage, under stones, in a field containing numerous cacti. In American Museum of Natural History. One paratype.—Soledad, Cienfuegos, Cuba, October 26, collected by P. J. Darlington. In Museum of Comparative Zoölogy. Two paratypes.—Cayamas, Cuba, June 6, collected by E. A. Schwarz and Porto Rico, with no definite locality, collected by George N. Wolcott. In United States National Museum.

Remarks. This new species resembles *Aephnidius* (= *Masoreus*) *piceolus* Chaudoir, and believing that it might possibly be that species I failed to describe it in the recent paper on "New Species of Carabidæ from Puerto Rico" Amer. Mus. Novitates. No. 686. Since these descriptions appeared a specimen of this species from Cuba was submitted by Dr. P. J. Darlington to Mr. René Oberthür for comparison with the Chaudoir type.

The reply from Mr. Oberthür stated the Cuban specimen was not Chaudoir's species. The West Indian species differs in having the antennæ and legs stouter than the true *piceolus* (although still slender) and probably differs in other ways.

The paratype from Cayamas, Cuba, is somewhat brownish black in color, possibly due to being collected before the coloring had fully developed.

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PSYCHE

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JOHN MERTON ALDRICH

By A. L. Melander

On May 27, 1934, with the passing of John Merton Aldrich, the nation's greatest accumulation of dipterological information has ceased to be. Easily the leader in this branch of zoölogy, Aldrich will be missed, and there is no one in line who is prepared to continue where he left off.

At the age of sixty-eight, Aldrich still counted on several more years of productive work. His mind was as keen as ever, and physically he had no intimation until two weeks before the end that an abrupt catabolic derangement was to close his life. He had even completed plans to start early in June on another of his biennial collecting trips to the Pacific Coast.

Aldrich was born on January 28, 1866, in Olmstead County, Minnesota. He attended school at Rochester, near by, and in 1888 completed the course for the B. A. degree at South Dakota State College. In 1889-1890, he studied under Professor A. J. Cook at the Michigan State College, and in 1891 received the degree of M. S. from South Dakota State College. Leaving an assistantship at South Dakota in 1892, he went to the University of Kansas in order to study with Professor S. W. Williston, and was awarded another degree of M. S. in 1893.

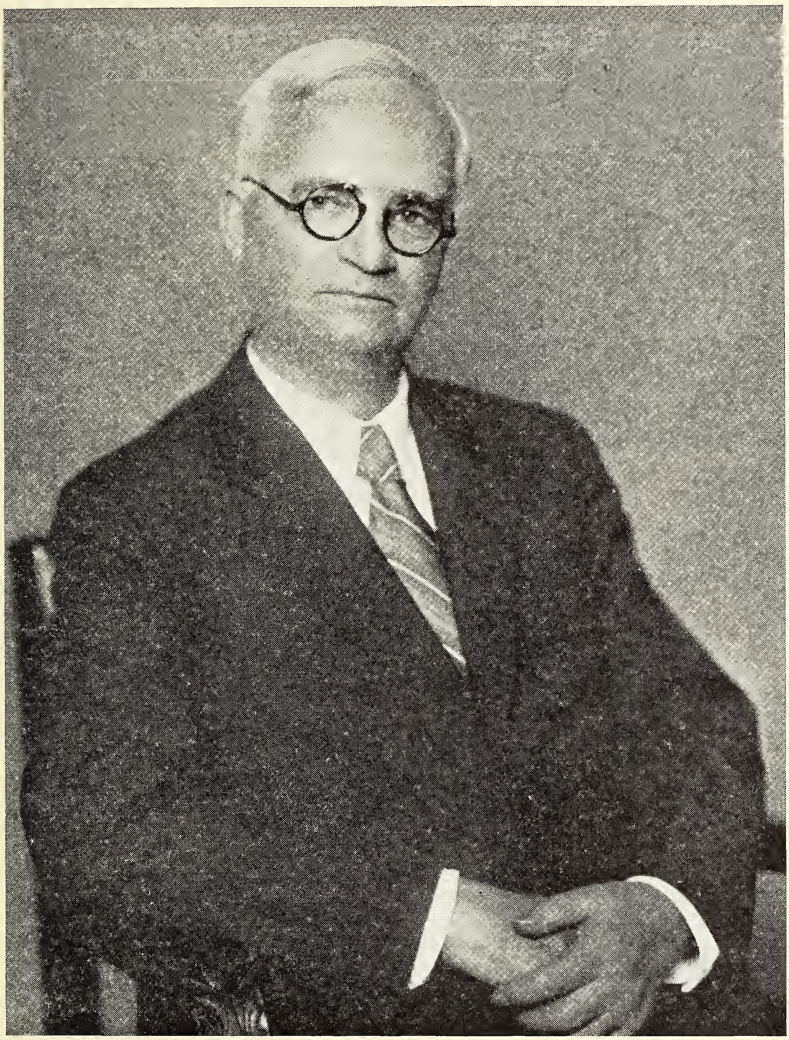
In 1893 the new University of Idaho opened, and Aldrich was selected to found its Department of Zoölogy. He married Ellen Roe of Brookings, South Dakota, and moved to Moscow. The loss of his wife and infant son four years later caused him to plunge most deeply into his dipterological work, and he began his card catalogue of the literature on Diptera, a project to which he contributed almost daily

until his last illness. By 1905, when this catalogue had reached publication size and was about ready for submission to the Smithsonian Institution, Aldrich married Della Smith of Moscow, Idaho, and securing sabbatical leave of absence from Idaho went to Stanford University for a year. His Ph. D. degree was awarded by Stanford in 1906. Fortunately Aldrich had moved his library and collection of Diptera to his father's house because during his absence the University of Idaho burned to the ground.

Aldrich always regarded Moscow, Idaho, as home. He had built a beautiful house at the edge of the University campus facing Moscow Mountain, his best beloved collecting ground, and there had established his library and collection. He had every prospect of continuing his useful work at Idaho, when suddenly after twenty years of service as its most eminent professor his connection with the University of Idaho was terminated. It is unnecessary now to reopen the sorry case and discuss the vagaries of an incompetent administration other than to recall that those of us who knew the situation well regarded the dismissal as an outrageous and unwarranted interference. Aldrich's ashes have been returned to Moscow, Idaho, and placed beside his first wife and his only child.

Idaho's self-inflicted loss proved to be the nation's gain. Dr. Howard immediately appointed Aldrich to the Bureau of Entomology, and for the next five years he was stationed at Lafayette, Indiana, to investigate life-histories of Oscinidæ and other Diptera affecting cereal crops. The death of Frederick Knab in 1918 made it necessary to transfer Aldrich to the National Museum, where he was appointed Custodian of Diptera and Associate Curator.

In 1928 Aldrich presented to the National Museum his personal collection of Diptera, numbering 45,000 specimens and 4,000 named species. With this he donated the unique and extensive card catalogue of Diptera. This index is the only source of information on all the literature of all the American Diptera, and with its cross references to synonymy is invaluable to all workers. It brings the Aldrich catalogue of 1905 to date. His library is the most complete assemblage of books and articles on Diptera, and de-



JOHN MERTON ALDRICH
1866—1934

servedly should be acquired by the National Museum to complement the collection and index.

Aldrich always generously shared his library, records, specimens, and information. Most present day dipterists owe more to him than their printed words of thanks can imply. Beyond the tremendous wealth of specialized information he held regarding the Diptera he was versatile in many lines. He was devotedly interested in the All Souls' Unitarian Church in Washington, of which he was a trustee, and conducted classes in religious history and education. He was keenly interested in politics and daily followed the doings of Congress. He was one of the organizers of the Thomas Say Foundation and served as editor from 1916 to 1931. He was secretary-treasurer of the Entomological Socity of America from 1915 to 1920, and President in 1921. In 1926 he was President of the Washington Entomological Society.

Aldrich had a remarkable gift of locating rare species on his collecting trips. His more extensive journeys included Utah and California, 1911; Alaska, 1921; Guatemala, 1926, and Sweden, 1930. He was meticulously careful in mounting specimens, in arranging the Museum collection, and in entering the records in his great index. His diary has daily entries for some fifty years, not merely a line or two, but a careful description of the happenings that befall an eminent man.

The accompanying bibliography, transcribed from the card index by his secretary, Mrs. Willis, gives his publications in chronological order. Outstanding in the list is the catalogue. This monumental work stimulated so many publications on the Diptera that its very importance in the progress of American entomology led to its rapid obsolescence. Would that its author could have been spared a few more years to give to all the codified information that he alone possessed. We regret his passing, but are thankful that such a man has lived and has been enabled to leave a permanent impress on science.

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BIOLOGICAL NOTES ON *SPHEX WRIGHTII* (CRESSON)

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The digger wasp, *Sphex wrightii* (Cresson), is one of the smallest Sphecids I have yet had an opportunity to study. It was placed in the genus *Coloptera* by Cresson in 1868. Professor H. T. Fernald has kindly determined this species[1] for me and gives an account of it in his recent monograph of wasps of the genus *Sphex*.[2] My study is based on observations made on the habits and nesting of the female since the male was not taken at all. The wasp was found only rarely at Owens Lake, near Boulder, in August, 1933, although its small size and somewhat concealed hunting habits may have caused this scarcity to appear more evident than actual numbers would warrant. Specimens were seen on different days, hunting among the tumble weeds. Two nests were taken: one, on August 4th; the other, a week later.

The nest of August 11th and the wasp's activity at the time appear more complete and possibly more typical than the earlier record and are given, in part, below. The presence of the nesting wasp was noted by means of a rather loud buzzing the digger made while she was excavating along a road in a field near the lake. She was found at 1:37 P. M. and observed continuously until the nest was finished and the wasp captured at 2:19. When first found, she had barely begun her vertical tunnel, but was already carrying

[1]Dr. T. D. A. Cockerell examined one specimen and likewise ascribed it to this same species. The writer is pleased to acknowledge this favor.

[2]For a consideration of this species and other Digger wasps of the genus *Sphex*, see the paper by Professor Fernald entitled "The North American and West Indian Digger Wasps of the Genus Sphex (*Ammophila* auct.)." E. O. Painter Printing Co., Deland, Florida. pp. 1-167. Plates I & II. Figs. 1-39. 1934.

soil on foot to a definite place some three inches away. This spot continued to be used for soil deposition until the end of the digging. The wasp backed out of the shaft with soil, turned and walked with it in her jaws and fore legs to this spot, released the load, walked back and down the tunnel for more.

This process and sequence continued 91 times between 1:37 and 1:58 P. M., during which time the wasp was not at all distracted from her work. Then, either feeling a need for a brief rest or change of activity, or more probably a solicitude for the safety and welfare of her already captured and suspended prey, she spent some time walking among the branches of one of the several tumble weeds which surrounded her nest and in visiting the moth larva. But the delay lasted only one minute, after which she was back again and digging. The period of excavation ended at 2:03 and the total number of observed loads removed up to this time was 109. Since she was well started when I arrived, the grand total doubtless was more, but probably not in excess of 125, or 130 at the most.

This small wasp spent from 2:03 to 2:06 in finding her hidden prey and in bringing it to the nest. She walked over and among the thistle stems, seemingly meeting with some difficulty in locating the larva. This is not surprising, for the branches in this area were exceedingly thick. Reaching the larva resting in the fork of a stem, she grasped it with her jaws on the ventral side back of the true legs, wrapped her fore legs about it and started. It was a green geometrid, long and slender, but larger and heavier than the wasp and bulky in comparison.

The trip to the tunnel was over stems, through and among branches, and the wasp met with minor difficulties on the way. She had to change her hold on the prey a number of times, and on five occasions was forced to turn back and bite or pinch with her jaws the posterior end of the abdomen of the prey. This was due to the fact that it was able to hold onto a stem with its anal legs and with sufficient force, when in a tight place, to momentarily stop the progress of the wasp. Once, after she had been thus hindered,

she stung it twice on the ventral side of different abdominal segments.

Arriving at the tunnel, she at first walked too swiftly, and moved farther than was necessary so that the head of the larva extended over the tunnel rather than just to or almost to it, as it normally does or should. But she quickly backed up a few millimeters, released the prey, walked down the hole in a journey of inspection, and out. Now she was ready for the provisioning of the cell. She did this by backing into the tunnel, seizing the prey and dragging it slowly out of sight. It took her exactly one minute to arrange the prey and fix her egg to its side.

She spent 12 minutes and 3 seconds, or from 2:07 to 2:19:03, in filling in the tunnel and at other activity about the nest site. Her first act upon emerging from the nest was to find and select a large pebble which was forced well down the shaft. Then she filled in the tunnel with loose soil which she kicked back into it and later tamped. This process continued, although some material was bitten loose nearby. This latter work was necessitated because the soil from earlier digging was not readily available. It had been carried over some stems and had formed a mound, but the stems and debris between it and the tunnel hindered its later use. The digger came several times to heavy pieces of material, such as sticks, clods, small pebbles and the like. These were carried away in her jaws on foot from the nest site and discarded, hence nearly all the material used was fine soil.

When the tunnel was nearly full, she searched long and tirelessly for a large object to finish filling the tunnel and as a blockade to the entrance. She tested many things, but all were rejected, until one finally met her needs. She laboriously carried this in her jaws and forced it well into the nearly filled tunnel. It was not flush with the surface but extended above. Time and again the wasp seized this with her mandibles, and for many seconds at a time pushed and vibrated it. At last, all seemed well to her. This was after she had scraped the surface around the nest site and had left objects scattered about. This was in contrast to her

earlier careful removal of such material, and resulted in the formation of a camouflage. She next made a few trips out and back (manner of a locality study although no apparent need for it, nor probability of a later return, was seen), then started away and was caught some distance from the nest.

The tunnel was nearly vertical and some 16 mm. long. The cell, at the end and at nearly right angles to the tunnel, contained the prey resting on one side, doubled up so that the posterior and anterior ends nearly met. A small, slender, clear egg about 2 mm. in length was attached to the upper side on the 2nd abdominal segment and near to a spiracle. The prey was able to kick about when stimulated. It was brought home and kept in a test tube, plugged with loose cotton, where further facts were obtained. The digestive tract was cleared of excrement before the egg hatched, and thus better food conditions provided for the wasp larva.

The egg hatched early on August 13, and by the evening of August 17 all the food provided for the larva had been eaten. A day later, its cocoon was well started, and by the evening of the next day it was, from outward appearances, complete. The larva while feeding, and especially at first, fed at the point where the egg had been fastened. It was greenish-yellow in color. The cocoon was photographed, when completed, but the larva within, upon removal from its protective covering and consequent exposure, was too active for picture-taking. It later was less active in its movements and more completely yellow in color. The drawing which accompanies this article was made some five months after the cocoon had been completed and at a time apparently when the insect was hibernating.

Another observation, at the same general location at Owens Lake, affords additional and supplementary facts of behavior. This female dug her vertical tunnel on a flat surface between plants in a soil in which there was some gravel. She produced an audible noise or buzzing as she used her jaws in digging. The loosened soil, held with the inner surface of her head and jaws, front of the thorax and

legs, was carried up and out of the tunnel as earlier described but, at this nest, only to a distance of 1¼ inches. She carried it out, at a time when the nest was nearly completely dug, at an average rate of five loads each minute.

An intruder, an ant in reality as well as in appearance, came upon the scene soon after observations began on the wasp. The wasp quickly retreated to a distance while the ant entered her nest, moved in and out, in impish fashion. But the wasp did not desert her nest very long. Soon back, she continued the work as before, only perhaps more hurriedly. It seemed that the ant had irritated her, and this later caused her to proceed in a more nervous manner. Her nest, when first found, must have been very nearly complete, for she soon provisioned it.

Her prey was a small greenish larva, which she had left suspended on a plant 18 inches away, hanging over a stem while she was working on the tunnel and cell. She now brought it to the nest, released it with its head to the entrance, backed within and pulled it in after her. This took place in good orthodox fashion, as did also the laying of eggs or the depositing of larvæ by a small tachinid fly just as the prey was disappearing from sight.

She remained in the cell but a few seconds, and upon emerging sought a large pebble to place in the tunnel below the orifice. The first one tried was too small, so she quickly removed it and continued searching for another. She conducted this activity on foot, searching on the ground among the plants near the nest. She soon tried another stone, which again was rejected for like reason as the first.

There followed at this point an interesting fight with a dark ant which was again intruding. The ant literally jumped at the wasp, the latter this time holding her ground and darting back at her foe. The contest continued for a few seconds with little advantage to either. Then each quit voluntarily, or possibly, the wasp was the victor. At any rate, she resumed her work and the ant, as it was scurrying away, was taken for identification.

A suitable pebble was secured, which fitted the upper part of the tunnel, fine soil was kicked in from the surface and

more was chewed loose from the sides of the opening. The loose soil filler was not great in quantity, and during her activity in securing it, small pebbles found in it were carried away and rejected.

The last phase of tunnel filling and protection consisted first in a diligent search for a large pebble. That she had an object of large size in mind was strongly suggested by the fact that she appeared interested only in the big ones. Too, she brought pebbles three different times and attempted to use larger ones than would fit, before one was

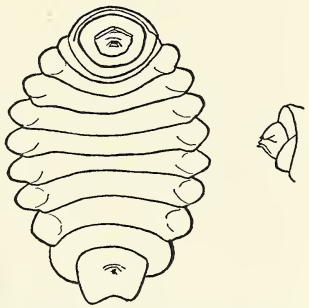

FIG. 1. Ventral view of hibernating larva of *Sphex wrightii* (Cresson). The head of the entire larva is above. Sketch of side view of head and anterior segment to the right. X6.

finally approved. It was a large and heavy object, but it fitted into the orifice and to spare, with a portion extending above the surface. She twisted this about in place, and vibrated it vigorously.

At this time another ant, a smaller species this time, bothered her not a little. She soon drove it away, however, and continued with the loose soil or in pushing and vibrating the pebble. A small stem unearthed in obtaining filler was seized in her jaws, carried away and left with the other rubbish of the surrounding area.

The nest filling was quickly finished, and the wasp flew away in and among the branches of tumble weeds where

from subsequent observation it was thought she finds her prey. She gave evidence at this time of searching for larvæ on the stems. If this be true, she must indeed be a good worker not even to spend some time at rest between one

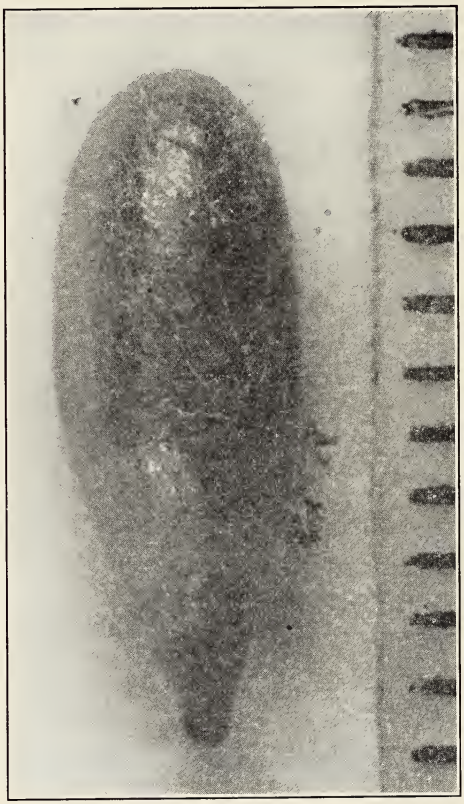

FIG. 2. Cocoon of *Sphex wrightii* (Cresson). Millimeter rule marks to the right.

nest provisioning and the hunt and capture of a prey for another. Her capture at this time allowed for no further observations.

The nest was dug out and the prey with an egg attached

on the lateral surface of an abdominal segment found in a shallow cell not far below the surface. Before the egg had the opportunity or time to hatch in my office at the University, it was found that fly larvæ had taken their toll. Internally, they had eaten the food to the extent that the body walls of the moth larva collapsed and the wasp's egg perished. The identity of the three larvæ, which each formed a puparium, was not learned. In later emerging from the puparia, they crawled into the cotton about them before the body parts were normally expanded and fully developed, thus preventing accurate comparison with normal flies and correct identity.

This wasp species did not use a tool at any time as the tool-users do, although it worked on the large pebble, trying again and again to force it farther into the tunnel and repeatedly vibrating it. This last record, however, is probably not typical and complete, since the ants disturbed the nesting wasp and probably abbreviated many, if not all of her activities.

The larger ant, which troubled the wasp, was taken, and has been compared with determined specimens in the collection of the University of Colorado. It is possibly a variety of *Formica fusca* L. It was very pugnacious, actually throwing itself at the wasp, which it may have "thought" to be an oversized ant and may have resented its intrusion in this territory. It is possible, too, that the ant was trying to obtain the prey of the wasp as food for its own nest.

The writer is indebted to Charles R. Bitter for the photograph of the cocoon of this wasp and to Louise Ireland for the drawing of the larva. He is pleased to express his thanks for this help, as also to Professor Fernald for the determination of this wasp and references to this and other digger wasps.

THE INSECT COLLECTIONS OF A PUBLIC MUSEUM[1]

By Albert P. Morse

The aims of a public museum may be said to be primarily recreational and educational. Sometimes a museum is maintained also partly for purposes of preservation of material collected for or presented to a State, or other political, scientific, or educational institution. In-so-far as its collections arouse interest in and impart information about man and his environment or activities it belongs in one or both of the first two fields; if it conserves specimens for future examination by students it may claim to belong in the last also. Formerly, in most cases, all three fields were cultivated by the same institution. Of late, with the development of children's museums, there is an increasing tendency to relegate the duty of preservation to the larger, better endowed, and perhaps more scientific institutions, leaving the fields of recreation and education to be cultivated largely by the smaller museums. These are, perhaps (sometimes, at least) more closely in touch with the people of the district in which the museum is located.

Probably all of the older museums, founded in a more serious age by serious-minded people, still retain or have passed through all the phases mentioned. My statements are based upon the experience of the Peabody Museum of Salem and may need to be modified by that of others. This institution was founded as the museum of the East India Marine Society of Salem, in 1799. Its purpose was to contain such objects as the sea-captains of Salem and vicinity brought back from beyond the seas for the enlightenment and delectation of themselves and their fellow-members. It has always been open to the members of the society and their friends,—and even to the general public, by free admission tickets,—since the day of its founding, and it is thus one of the oldest public museums in the country.

[1]Address of the retiring President of the Cambridge Entomological Club, May 8, 1934.

In 1867, on receipt of the (for the time) munificent gift of $140,000 from George Peabody, a banker of London (born in South Danvers, Mass., since named Peabody in his honor), it took the name "Peabody Academy of Science," and embarked upon a career more particularly devoted to education. The natural history collections of the Essex Institute of Salem (founded in 1848) were added to its own, and in its early days, as the Peabody Academy of Science, its destinies were presided over by several men whose names were to become known later through their labors in scientific fields. I refer to such men as Frederick W. Putnam, Edward S. Morse, Alpheus Spring Packard, etc. Shortly thereafter, it met with financial reverses, and certain of its collections, notably those of the insects described by Packard, which faced almost certain destruction by pests, were turned over to the Museum of Comparative Zoölogy at Cambridge, Mass., in order to assure their preservation. A large number, it is true, remained, but, being almost continually exposed to white light, their deterioration was rapid.

In addition to the insect collections named above, material naturally accumulated in those groups which were the special study of officers of the museum; and, as the publisher of the "American Naturalist," the Museum was the recipient of more or less material sent in as payment for subscriptions to that journal. These specimens, together with those received from persons seeking information about local insects, accumulated rapidly, resulting in the formation of a collection of varied character and provenance. In addition, specimens of the local butterflies in Denton tablets, and of the commoner local moths, made by interested amateurs, had found a place in the museum collections at the beginning of the twentieth century.

With the exception of the local butterflies, these specimens were practically all pinned, and were contained in trays about 10 x 12 inches in size, painted white, and lined with white paper stretched on both sides of a wooden frame in an ingenious fashion devised by Prof. E. S. Morse (see Amer. Nat., vol. 1, p. 156, or Riley, C. V.—Directions for Coll. & Pres. Insects, Bull. U. S. N. M., no. 39, p. 105).

They were displayed in a glass-covered rail-case in the gallery of the Museum where they were for the most part continuously exposed to the damaging effects of white light. That some of the specimens became, with the lapse of years, nearly unrecognizable, is not to be wondered at.

Such was the state of things when I was placed in charge, for a period, at first, of one day per week, except during the summer. Later, the care of all the natural history collections,—geological, botanical, and zoölogical, was added to that of the insects, and the time allotted gradually increased, until all the time that I can now give has been taken.

Mr. John Robinson (a very good old-time botanist, by the way), who acted as Director during Prof. Morse's absences in Japan and on his lecture-tours, used to say that his personal knowledge of insects was limited to an acquaintance with those species most frequently brought in by children, or more or less conspicuous in themselves,—such as the house centipede, *Scutigera forceps,* formerly a common denizen of the city,—and the larger moths and butterflies. In time, these were supplemented by the gipsy and brown-tail moths, and by pests responsible for local outbreaks.

The persons visiting a museum who show an interest in insects comprise: 1st, the children of the vicinity, to whom the world and its wonders are new, and who do not customarily think, in the manner of their elders, of insects as small fry, unworthy of attention; 2nd, people of inquiring minds who have observed something new to them (it may be very old to an entomologist) ; 3rd, people to whom an insect has suddenly revealed itself as a possible pest, who seek information regarding it and how to control it; and 4th, persons, old or young, who judge everything by its commercial value and hope to acquire dollars or cents by selling their captures to the Museum. (It may even be an almost totally denuded moth or butterfly or some similar worthless specimen.) These must all be treated with the utmost courtesy if one would make friends for the Museum; information and advice must be freely imparted; gifts of much-rubbed butterfly or legless grasshopper must be gratefully accepted or declined with thanks,—if you would

have them continue to bring to you their treasures (or what they regard as such). Our only local specimen of *Mantispa brunnea* was captured by a resident clergyman, who had no idea of its rarity or interest, and who had previously brought in some execrable material.

What Collections of Insects Do Public Museums Need?

FIRST,—exhibition collections, of large-sized specimens, to illustrate systematic groups and the most striking facts of life history and of damage done. These should contain inflated larvæ, and sometimes pupæ and cocoons, as well as adults. No rarities! Only common and readily replaceable specimens. (Do not submit rare specimens to destruction by white light! Use boxes with covers, or curtains for their protection). Probably enlarged models, showing the anatomy in detail, especially of the mouth-parts, would be valuable. I have not had an opportunity to try them, but I have heard that the enlarged model of a mosquito at the American Museum of Natural History in New York is a very popular exhibit. These enlarged models should show at least two or three types of mouth-parts and of life-histories.

I remember what a pleasure it used to be to study the New England collection of insects on exhibition in the Boston Society of Natural History, faded and discolored though they were. Probably in no way is it possible to convey to the mind of a novice such a good idea of the fauna of a particular region as by the exhibition of its component species.

Especially do I remember being seated at my table in the old entomological laboratory at Cornell University one morning when in breezed Prof. Comstock with a box in his hand and a small boy with a net in tow. "Give me your chloroform bottle, Mr. Morse, and I'll show you something," was his salutation. The bottle was promptly produced, its contents applied, and presently he exclaimed, "There, what do you think of that for central New York?" "Hallo", said I, as the great moth was revealed, "*Erebus odora!*" "Where in the world did you make the acquaintance of that creature?" said Prof. Comstock, with an expression of astonishment on his face. "Oh," said I, "the Boston Society

of Natural History has a series of New England insects on view and among them is an example of this species." "There," said he, "I've always claimed that there was danger that the boys would use such a collection as a pony if we had one here, but what you say has nearly convinced me that such an exhibition series would be a good thing." This happened to be the first specimen of this species to be secured for the entomological collection of Cornell University.

An exhibition collection is undoubtedly a good thing if it inspires interest in the visitors to a museum, and if it can be properly protected from light. This can be done by the use of opaque curtains or by keeping it in drawers to be pulled out from a cabinet when it is desired to consult it. At the Peabody Museum, we have a considerable series of insect exhibits arranged in flat, glass-covered rail-cases protected by covers of opaque brown cloth attached along one side and removable by the inquiring visitor. Hitherto, it has rarely been necessary to cover up the specimens after inspection, persons removing the covers being unbelievably careful to replace them.

SECOND,—There should be at hand in every public museum, a reference or study collection for the benefit of the curator in charge of insects and the serious-minded public seeking information. This should contain, so far as possible, examples of every local species and its life-history, their modes of attack and specimens of their work,—all to serve as an aid in identification and for the enlightenment of the serious student. Determinations of species should be by some recognized authority, if possible. This is the place for the rarities. Specimens should bear complete data as to locality and date of capture; ecological conditions should be stated, if possible; and taxonomic groups other than genus and species may well be indicated.

THIRD,—There should be topical or ecological collections, either illustrating the insects associated with certain plants, as visitors, pests or pollinators, or with a definite kind of environment,—insects of sandhills, ponds, streams, etc. These groups may be limited in number and should be of

readily replaceable material. Those of pests should contain numerous specimens in order to convey subconsciously the idea of abundance.

FOURTH,—The geographical or zonal distribution of the insects of a large area can perhaps be fully as well shown by charts (preferably in conjunction with specimens) as by insects alone, and the topic is generally one of interest even to the transient visitor.

There are also to be considered the needs of the genuine scientific student resident in the vicinity, and of the school-teacher trying to awaken an interest in the natural world in the minds of her pupils through this medium. Give them all the aid possible! "Cast your bread upon the waters and after many days it shall return unto you." Very likely you can give them specimens also.

Mr. Charles W. Johnson, formerly in charge of insects and mollusca at the Boston Society of Natural History, after a long and valuable experience wrote an article on this subject which should be read by everyone interested (see Museum Work, vol. 1, no. 5, Feb. 1919).

In closing, I wish to give a word of warning (and this advice will apply as well to other things as to insects) :—Accept no collections for an unlimited period of time or that must be kept separate from others! One is liable to find oneself handicapped ultimately by such a procedure, even if it seems wise at first. Twenty years ago we accepted at the Peabody Museum for temporary storage a very good collection of butterflies and moths in tablets. This is still useful as an exhibit: but it was accompanied by a space-consuming collection of mounted birds (some of which were useful at the time, it is true, but which no longer are), for which storage must be provided. To our disappointment, the owners have as yet shown no tendency to regard the Museum as other than a place of temporary storage of the collections, intead of, as hoped and as would naturally be expected, after a reasonable number of years, a more or less willing recipient, the collections to be made use of as seemed wisest to experienced persons.

POSSIBLE POLYPLOIDY IN THE HYMENOPTERA

By Sheldon C. Reed

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The Bresslau-Harnisch lists of animal chromosome numbers (Tab. Biol. 4) include data for the twenty species of Hymenoptera whose chromosome numbers were known at that time. Records subsequently published give the numbers in two additional species, *Habrobracon juglandis* and *Pteronidea ribesii*. The total may be summarized in this fashion:

1	species,	haploid	number	*4*
8	"	"	"	*8*
1	"	"	"	9
3	"	"	"	10
5	"	"	"	*12*
3	"	"	"	*16*
1	"	"	"	*24*

Eighteen of the twenty-two species have chromosome numbers of 4 or a multiple of 4; whereas only four species have different chromosome numbers (9 or 10). These numbers are representative of seven families out of more than one hundred in the Hymenoptera and seem to be a random sample of what may be expected to be the situation in the other species whose chromosome numbers are yet unknown. Though the number of species which have been investigated is very small, the idea suggests itself that these chromosome numbers may be a result of polyploidy such as is known to occur in plants.

There is very good evidence that about half of the Angiosperms are polyploids. From such studies as those reviewed by Darlington (Darlington's Cytology, p. 212) we see that in polyploid series one finds many species with double the basic chromosome number, fewer with the number obtained by a second doubling and still fewer resulting from further doublings of the basic number. Such would seem to be the case even in this small sample from the Hymenoptera. A second point also demonstrated by the abundant plant material is that in polyploid series there are few species with *prime* numbers as their haploid count. In the Hymenoptera there are no species with prime numbers. If the chromosome numbers in the order were entirely fortuitous, one should expect several species to show prime numbers as their haploid count.

The rareness of polyploidy in the animal kingdom and particularly in diœcious species has been considered to be due, at least in part, to the fact that such species are in one sex heterozygous for the sex chromosomes. Multiples of the chromosomes in the vast majority of animals would thus cause an upset of the balance between sex chromosomes and the autosomes as was suggested by Muller (Am. Nat. 59) in regard to polyploidy. He suggests, however, that polyploidy might occur in the Hymenoptera.

In the Hymenoptera it may have been possible to avoid this difficulty since they are almost unique among insects in that their *males are haploid.* Thus if there is *any* order of insects in which polyploidy is possible it would seem to be the Hymenoptera.

The suggestion that the series of chromosome numbers in the Hymenoptera may have arisen by polyploidy rests, then, on these considerations: 1, all but four of the species have chromosome numbers which are 4 or a multiple of four; 2, the existence of haploid males may have allowed polyploidy to occur.

ENTOMOLOGICAL INVESTIGATIONS IN THE CHIRIQUI REGION OF PANAMA

By Lawrence H. Dunn

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The notes presented in this paper are based largely upon observations made and specimens collected during a visit to the Province of Chiriqui, in the south-western corner of the Republic of Panama, in July, 1929. This expedition was organized by Dr. H. C. Clark, Director of the Gorgas Memorial Laboratory and included also Dr. G. B. Wislocki and Dr. A. H. Schultz, from the Johns Hopkins University, and the writer. The purposes of this visit included medical, embryological, anthropological and entomological studies on the wild monkeys of that region. This report deals with the entomological results. The writer took advantage of the opportunity offered to secure and examine a number of birds and other animals in addition to the monkeys in order to gain some general knowledge of the ectoparasites of the wild animal life of the areas visited. Specimens of the prevalent blood-sucking diptera were collected whenever possible and a few observations on the mosquito breeding occurring in the vicinity of our camp were also carried out. These investigations were conducted at Camp Pital and Puerto Armuelles and covered the period from July 11 to July 29, 1929, sixteen days at the camp and three days at the port.

Dr. Clark made two later visits to Chiriqui, in February, 1930 and August, 1931. On his 1930 trip he spent several days (in camp) at La Vaca, in a more virgin part of the same general area as Camp Pital. In 1931, he made a brief visit to the large banana plantations of the Chiriqui Land Company at Puerto Armuelles and Progreso. The latter station is situated a few miles inland from the coast, on the

Puerto Armuelles-David Railway. Mr. W. H. W. Komp, of the U. S. Public Health Service, accompanied Dr. Clark on his 1930 trip and Dr. Theodore Trimble, of the Rochester University, Rochester, N. Y., was his companion in 1931. On both these occasions a number of ectoparasites were obtained from the various animals examined as well as of the blood-sucking diptera most commonly encountered.

Since the specimens obtained during the three expeditions to Chiriqui represent many of the common species of insects and other arthropods affecting man and animals in that region, they are listed with annotations in the following pages.

Camp Pital was located in the humid lower tropical zone of the fairly level coastal plain of the south-western part of Chiriqui. It was very close to the Costa Rican border, probably not more than eight miles by direct line from the Pacific coast. Here a square area of about twenty acres had been cleared for banana culture. All trees had been felled, larger ones being left to rot and banana sets had been planted in the open spaces between the logs. The area surrounding this clearing was heavily forested, with trees of large size and an undergrowth of luxuriant vegetation. The pita plant, *Ananas magdalense,* was abundant in this locality and it was from this plant that the name of the camp was derived. The undergrowth was not of sufficient density to necessitate the use of a machete when walking in the forest, and since there were several narrow trails leading in different directions, a considerable freedom of movement was possible in the forest nearby.

The animal and bird life in this region was abundant and varied and the easy passage in the forest made good hunting conditions. It was also a nearly ideal location for collecting blood-sucking diptera, since the abrupt change from the deep shade of the forest to the open sunlight of the clearing provided conditions favorable for both shade and sun loving species.

Two native hunters and one of the members of our party were usually out after specimens of animals and birds during the early part of each day. A number of muslin bags

of various sizes were carried by the hunters and each animal or bird shot was immediately placed in one of the bags which was then closed and tied with twine.

At the camp each bag was carefully opened on a large piece of Canton flannel spread out on an improvised table. The bag was slowly turned back until the animal was left lying in the center of the flannel. Any ectoparasites present were usually collected first from the animal and then from the bag, if any adhered to the inner side of it. A comb was sometimes used in examining animals with long hair. With birds it was found advisable to pluck out most of the feathers. Some of the birds were infested with parasitic flies that were quite active and difficult to capture. When such birds were brought in, they were placed, while still in the bags, in a wooden box and sprinkled with chloroform. The vapor of this penetrated the bags and stupefied or killed all the flies that were on the birds, which were then easily collected. The nap of the Canton flannel on which the examinations were made impeded any of the fleas, lice, etc., that attempted to hop or walk on it and facilitated their capture.

Engorged ticks in larval or nymphal forms were placed in pill boxes or glass tubes in order that they might develop to later stages. Dipterous larvæ producing Myiasis were removed from animals and, if nearly mature, placed in wide mouth bottles containing about an inch of damp earth to allow them to pupate and emerge as adults.

Since the study of monkeys was the principal purpose of our expedition to Chiriqui, a few words about the examination of these animals are appropriate. A total of 107 monkeys killed or captured at Camp Pital were examined for ectoparasites. This included 53 Orsted's titi monkeys, *Saimiri orstedii orstedii;* 29 Panama white-throated monkeys, *Cebus capucinus imitator,* and 25 Geoffroy's spider monkeys, *Ateles geoffroyi.* Although the examination of these monkeys occupied a considerable part of my time while at the camp, they were not productive of ectoparasites.

One female tick was found walking about on a freshly

killed titi monkey, but since it was not attached and contained no blood it was not credited with being a parasite of the animal.

The howling monkeys, *Alouatta palliata inconsonans,* at Puerto Armuelles were found to suffer from Myiasis due to dipterous larvæ but no howlers were taken during our stay at the camp and no myiasis was noted in any of the monkeys examined there.

No lice-infested monkeys were found. The freedom of these monkeys from ectoparasites causes me to wonder if the species examined at the camp are habitually free from infestation of parasitic arthropods in this region or if it may have been due to the climate conditions prevailing at the time.

A very large number of blood-sucking and parasitic diptera were collected, various genera in several families being represented.

It was somewhat surprising to find that comparatively few adult mosquitoes were in evidence at the camp. There were a number of streams and pools exposed to sunlight in the cleared area, while in the surrounding forest there were numerous streams, pools and small swamps in dense shade. Thus the conditions in the immediate vicinity of the camp were suitable for mosquito larvæ that preferred either sunlight or shaded environments. There were also many natural depressions present in the large tree trunks lying about the clearing which contained varying amounts of water adapted to certain species. The so-called tin can invasion had preceded us at this camp and a considerable number of tin cans that had previously contained fruits or vegetables had been thrown in a pile near the camp by former occupants. In some of these cans a small amount of the contents had been left and as the cans filled with water from rains this vegetable matter, and also leaves that had fallen into the cans from nearby trees, became decomposed and caused the water to become very foul. Mosquito larvæ were found in a number of these cans. Enamelware soup bowls were used for breeding out the larvæ investigated. It is to be regretted that the opportunity did not permit a more

extensive study of the mosquitoes breeding in this region, since in my opinion such observations would very probably be repaid by finding many interesting species.

Anopheles albimanus Wiedemann. From one to four adults of this species were collected each morning on the inside of the wall netting and cloth ceiling of the camp. They probably gained entry through numerous small holes and rips in the netting. Cursory examinations of several of the nearby pools and streams were made but no larvæ of this or other species of Anopheles were found.

Anopheles punctimacula Dyar and Knab. Two females of this species were captured on the ceiling inside the camp.

Culex bonneæ Dyar and Knab. Adults of this species were bred from the larvæ present in considerable numbers in a ground pool (in which the end of a tree trunk was lying). The finding of this species in Panama increases our knowledge of its distribution since it previously has been reported only from Dutch Guiana where it is a common species and breeds in artificial receptacles, tree holes and ground pools.

Culex corniger Theobald. Larvæ of this species were numerous in several small ground pools.

Culex coronator Dyar and Knab. Numerous larvæ were present in a ground pool surrounding the base of a large stump in the cleared area.

Culex declarator Dyar and Knab. This species was breeding in profusion in water in a natural hollow in a log in the clearing.

Culex inflictus Theobald. Breeding in old tin cans where it occurred both alone and in association with *Joblotia digitata*. The larvæ were also found in a hollow in a log in company with *Hæmagogus lucifer*.

Aëdes angustivittatus Dyar and Knab. Represented by three females that were captured while biting man at the edge of the forest.

Aëdes quadrivittatus (Coquillett). Several females were captured near the camp while in the act of biting man. They

were taken in late afternoon and on cloudy days. Finding this species at Camp Pital indicates that it has a rather unusual altitudinal range since it previously has been reported only from higher elevations, having been taken up to 9,000 feet, and was considered as an *Aedes* of high altitudes only.

Mansonia titillans (Walker). Two females of this species were taken within our camp and a third was captured outside while biting man. It was remarkable that this mosquito was not more in evidence since masses of the floating water plant, *Pistia stratiotes,* to the roots of which the larvæ of this species remain attached, were present in the Madre Viejo River about two miles from Pital.

Hæmagogus lucifer Howard, Dyar and Knab. Many adults reared from larvæ collected from water in a hollow in a log. *Culex inflictus* larvæ were also present in this water.

The entomological fauna of Camp Pital was found to be rich in blood sucking flies of the family Tabanidæ. The door of the camp had evidently been open for some time previous to our arrival and many flies of various families had entered and were grouped about on the inside of the screens when we moved in. A number of these were captured and thirty-eight proved to be Tabanidæ, with four genera and seven species represented.

A mule used for transporting supplies was kept at the camp and during the greater part of the day it was tied at the edge of the forest to graze. This animal proved to be good bait for attracting Tabanidæ and numerous specimens were collected from it. It also gave me an opportunity for making a few observations concerning the biting habits of some of the species.

Pangonia prasiniventris Macquart. Flies of this species were quite numerous and caused much annoyance to the pack animals at Camp La Vaca in February, 1930. Dr. Clark collected ten specimens at this time.

Stibosoma flavistigma Hine. Only one specimen of this large fly was captured on the mule at Camp Pital. It was noted approaching with a swift circling flight and a loud

buzzing sound. It made several attempts to alight on the belly of the mule but each time it struck with so much force and noise that the animal flinched and twitched its skin to prevent it. After a number of trials it succeeded in alighting on the inside of the upper part of the hind leg and began to feed. This gave me a chance to capture it. A second specimen was also seen making several efforts to alight on the mule but, like the first one, it struck so forcibly and noisily that it startled the animal each time and caused it to flinch and stamp its feet. The fly finally ceased its attempt to alight and flew away. It did not return while I was observing the mule.

Lepidoselaga lepidota Wiedemann. Three of these flies were captured inside the camp at Camp Pital. They were taken some days after our arrival and apparently had gained entrance through holes in the screening or while the doors were open. A fourth specimen was captured as it was feeding upon an ox in a pasture near Esperanza Station. Since this species appears to pass its larval and pupal stages at the base of the crown of leaves of the water lettuce, *Pistia stratiotes,* it is quite probable that these flies were much more numerous in closer proximity to rivers, streams, pools, etc., in which these plants were present.

Chrysops melænus Hine. Twenty-four flies of this species were captured while they were feeding upon the mule at Camp Pital. They seemed to confine thier attacks mainly to the region about the animal's ears.

Chrysops calogaster Schiner. One of the small flies of this species was found inside the camp at Camp Pital upon our arrival.

Dichelacera analis Hine. Flies of this species were found to be much more numerous than any other of the Tabanidæ and were the most persistent in their attacks on man and animals. A total of 165 specimens were collected at Camp Pital and Puerto Armuelles. Twenty-two of these were found inside the camp upon our arrival, where they had entered apparently for shade. The remainder were taken while biting either man or the mule. They were present

throughout the day and until late in the evening, seeming to become more active at twilight. They were vicious biters and very persistent in their attempts to obtain blood. They apparently were attracted by motion and when one was moving in the forest they followed to circle about with a vicious hum and dart at one's face, hands or any exposed part of the body and immediately begin biting. If one stood or sat quietly for a few minutes most of these flies gradually disappeared, although a few invariably remained and continued their efforts to feed. They were to be found by the hundreds attacking the mule at nearly all times. Some preference seemed to be shown for the neck and head but they were found on nearly all parts of the animal's body at times. They were rather slow in filling with blood and when gorged became quite sluggish. The wings were held partly extended while feeding. Although this species was much more common along the edge of the forest, they frequently appeared in bright sunlight as well.

Dichelacera submarginata Lutz. This was nearly as abundant as *D. analis* and 94 specimens were collected, fifteen found inside the camp resting on the screens. They seemed to center their attacks upon the mule and apparently were not much attracted by humans, only one being taken while biting man. They attacked the mule all during the day and early evening and, strangely enough, never attempted to feed on any part of the animal except the lower legs. From 20 to 50 were usually present on each leg and it was very seldom that a single individual was noticed biting above the knees. They gathered in masses at the fetlocks and around the coronary region at the top of the hoofs. They are slow feeders and required some little time to engorge. The mule did not seem to experience much annoyance from their attacks and seldom stamped its feet to prevent their bites. When brushed from the animal's legs these flies flew only a few inches and immediately returned to resume their feeding. They seemed to be noiseless in flight when approaching or leaving the mule.

Tabanus albocirculus Hine. Flies of this species were

quite common at Camp Pital and were present in considerable numbers on the mule. It was noted that most of those on the animal at any one time were located about the head and neck.

Tabanus calignosus Bellardi. This species was represented in our collections by only two specimens. One of these was taken inside the camp and the other was captured while feeding upon the mule.

Tabanus festivus Hine. Five of these flies were collected at Camp Pital, three on July 13th and two on July 20th. They were not in evidence except while feeding, or about to feed, on the mule. They approached with a swift flight and after a short circling about darted at the animal and settled on the lower frontal area of its head. All five seemed to attempt to bite at almost the same spot. The first three captured were taken within an hour and although they came only one at a time the sites of the three bites could have been covered with a silver dollar. These flies were very wary and it was almost impossible to capture them until after they had begun to take blood.

Tabanus fumomarginatus Hine. Five specimens were taken at Camp Pital, two in the camp on the evening of our arrival and three others later on the mule.

Tabanus inanis Fabricius. Two flies of this species were collected by Dr. Clark as they were attacking the pack mules at Camp La Vaca in February, 1930.

Tabanus leucaspis Wiedemann. Two of these flies were collected from the mule at Camp Pital.

Tabanus occidentalis Linnæus. This species was present in abundance and attacked the horses and mules at Progreso in August, 1931. Two specimens were collected by Dr. Clark at this time.

Tabanus stenocephalus Hine. This species was quite common at Camp Pital and a number of specimens were captured as they fed upon the mule. They did not appear to favor any particular part of the animal.

Tabanus unistriatus Hine. Many flies of this species were

present at Camp Pital and Puerto Armuelles. They bit man and animals with equal readiness.

Lynchia augustifrons (Van der Wulp). A male and female of this species were collected from a Swainson's toucan, *Rhamphastos swainsonii* Gould, at Camp Pital.

Stilbometopa ramphastonis Ferris. Two females of this species were found on a Swainson's toucan, *Rhamphastos swainsonii* Gould, at Camp Pital. These proved to be a new species and were named and described by Ferris.

Ornithoica confluenta (Say). Three specimens of these flies were collected from two Swainson's toucans, *Rhamphastos swainsonii* Gould, at Camp Pital.

Olfersia vulturis Pan der Wulp. Flies of this species were collected from four black vultures, *Catharista urubu* (Viellot), that were examined at Camp Pital. Three of these birds yielded three flies each, and five were taken from the fourth.

Olfersia spinifera (Leach). Several of these flies were taken from a king vulture, *Gypagus papa* Linnæus, by Dr. Clark at Camp La Vaca. There were many of these flies present on the bird but they were very difficult to capture. So many escaped that a bed net was hung from a limb of a tree and the dead bird placed in it in order to secure the flies. Four specimens were collected inside the net. The following day one of these flies was captured as it alighted upon the head of the native cook and attempted to crawl into his hair. The second day another fly of this species was found on the outside of the bed net, in which the bird had been placed. (It had been left suspended in order that it could be used if others with parasitic flies were taken.) Probably these two flies were among those that had left the bird to escape capture (one or two days previously and had later returned to seek their host again.)

Lipoptena mazamæ Rondani. Twelve of these small parasitic flies were found on a brocket deer, *Mazama sartorii reperticia* Goldman, that was killed in the forest near Camp Pital.

Cuterebra bæri Shannon & Green. Four large, mature larvæ of this species were collected by Dr. Wislocki from a young, black howling monkey, *Alouatta palliata inconsonans* Goldman, that was killed at Puerto Armuelles on July 27, 1929. These four larvæ were located in the skin in the region of the neck and an empty nodular pocket from which a fifth larva apparently had emerged was nearby. Three other young howling monkeys were shot at the same time. One of these was infested with a small, immature larva of this species. The other two each bore a number of empty nodular pockets from which it is more than likely that larvæ of this species had emerged a short time previously. Specimens of the larvæ were reared to adult flies in order to confirm the identifications. Larvæ of this species were collected in the Darien region by J. L. Baer, in 1924, and have been reported upon by Shannon and Green (1). Since there seems to be no record of this species having been taken in Chiriqui this is probably the first report of its presence in Western Panama.

Dermatobia hominis Linnæus. A larva of this species located itself on the inner side of Dr. Clark's elbow at Camp La Vaca in February, 1930. Two coatis, *Nasua narica panamensis* Allen, killed at Camp Pital, were found to be infested with larvæ of this species. A mature larva, about 21 mm. in length, was located in the right femoral region of one of the animals. The second coati was infested with two of the larvæ. They were approximately two-thirds mature and were situated at about the middle of the animal's tail, but little more than an inch apart. The tail was badly swollen, crooked at an obtuse angle and looked as though it were broken. From the appearance of the lesions one would assume that both these animals had suffered a considerable amount of pain and discomfort from the presence of these larvæ.

Gastrophilus nasalis Linnæus. A total of 58 of the larvæ, or "bots," of this species was found in a horse that was autopsied at Progreso, Chiriqui, on August 25, 1931. Fifty-six of these larvæ were clustered to form a rosette near the

pyloric orifice of the stomach while two were found unattached in the stomach contents. These larvæ were large and apparently nearly mature. This seems to be the first record of this species in Panama and since it was found in an animal that had always been on the Isthmus there is no doubt regarding it being established in Chiriqui, at least.

Stomoxys calcitrans Linnæus. These flies were very common in the vicinity of Camp Pital and great numbers of them could be found feeding upon the pack mule all during the daylight hours. They apparently made no attempts to attack man.

Cochliomyia macellaria Fabricius. The screw worm flies were extremely abundant in the vicinity of Camp Pital during our stay there. They usually appeared in large numbers as soon as animals that had been killed were brought into camp and they became very active in darting about and attempting to deposit their eggs on the carcasses. The hunters, after killing and bagging animals, frequently left them lying by the side of some forest trail or hanging from the branch of a tree to be carried into camp on their return. Sometimes these bagged carcasses were left for periods of three or four hours and when much bleeding occurred the bags become blood soaked and large masses of eggs, most of which were probably of *C. macellaria,* were deposited on them. Occasionally these masses of eggs were several inches in diameter and nearly half an inch thick, and must have represented the ovipositions of large numbers of the flies. There were often a number of such masses attached to a bag, adhering very tightly to the cloth and difficult to remove completely by washing or scraping. A novel method finally evolved for cleaning the bags was to hang them in a stream and let the countless numbers of small minnows that were present tear the eggs from the cloth and devour them. These minnows came in great numbers as soon as an egg-bearing bag was placed in the water and they remained to feed as long as a single egg was available.

Simulium quadrivittatum Loew. The small blood-suck-

ing flies of this species were numerous in the vicinity of Camp Pital and proved to be very annoying. They were persistent in their attacks and seemed to be ready to bite at nearly any time during the day or early evening. They would attack freely while in bright sunshine in open spaces but under such condition usually selected the under side of one's arms or hands and did not direct their attacks to the face. On rainy or cloudy days they seemed to appear in greater numbers. While feeding they became swollen and the abdomen when distended with blood assumed a deep red color. After becoming engorged they were very sluggish and could easily be picked off with one's fingers. A large number of specimens of this species was collected.

Culicoides fluviatilis Lutz. The small sandflies of this species were very prevalent at Camp Pital. Any of the members of our party who remained seated in a shady situation for a few minutes were attacked by numbers of these bloodthirsty diptera. They seemed to become more active and persistent in their attacks during late afternoon and early evening.

Culicoides parænsis Goeldi. Only one specimen of this species was taken at Camp Pital. They were, however, very common in the vicinity of Puerto Armuelles. One morning while at the latter place I was engaged in watching the actions of a group of monkeys in the forest about a mile from the sea-shore and remained seated in a small open area for nearly thirty minutes. During this time I was bitten by a number of these flies. Their attacks seemed to be mostly on my arms and hands. A number of specimens captured at this time all proved to be *parænsis*.

Lasiohelea sp., probably *stylifer* Lutz. One specimen was collected at Camp Pital. It was taken while feeding upon my arm in the early evening as I was seated under a palm-thatched shelter.

Ctenocephalides felis Bouché. A few fleas of this species were taken from a dog owned by one of the native hunters at Camp Pital. Undoubtedly this species may be found in abundance throughout all parts of Chiriqui where cats or dogs are present.

Rhopalopsyllus australis tupinus Jordan and Rothschild. Several males and females of this species were taken from two agoutis, *Dasyprocta punctata nuchalis* Goldman, that were captured at Camp Pital.

Rhopalopsyllus lugubris cryptoctenes Enderloin. This species was represented by five specimens on one of the agoutis.

Pediculus (*Parapediculus*) *atelophilus* Ewing. This species of sucking lice was found in abundance upon two baby monkeys purchased at Camp Bogamani by Dr. Clark in 1930. Camp Bogamani is located about five miles from Camp Pital. It is one of the District Camps of the Chiriqui Land Company and many of the men employed in clearing work and banana culture kept monkeys and other animals as pets. Those obtained there consisted of several very young red spider monkeys, *Ateles geoffroyi* Kuhl, and one white-throated monkey, *Cebus capucinus imitator* Thomas. One of the red spider monkeys was noted as being infested with lice at the time it was purchased. It was necessary to confine these six monkeys in the same cage during a period of about three days while being brought to this laboratory. On their arrival many lice were found on the white-throated monkey. It would seem that it must have been infested before being purchased at Bogamani. Both of these infested monkeys were also heavily infected with malaria at this time and were in very poor condition. The heavy infestation of the white-throated monkey was probably due to its weak and emaciated condition. Under normal conditions the *Cebus* monkeys keep themselves well picked over and seldom become infested with lice. The other four red spider monkeys each showed an infestation with lice a few days after arrival at the laboratory. It is of interest to note that no lice were found upon twenty-five red spider monkeys and twenty-nine white-throated monkeys that were examined soon after being captured or killed at Camp Pital while one, probably two, out of six monkeys that had been kept as pets proved to be infested with *Pediculus* (*Parapediculus atelophilus*.

Since nineteen species, representing eleven genera and

four families, of Mallophaga were collected from the comparatively small number of infested animals and birds, it is probable that many species of biting lice would be found on more extensive collecting. Seven species were taken from the tinamous, four from the black headed vulture and three from the Swainson's toucans. In listing these species I have followed Harrison's (2) work of 1916, since this seems to be the latest comprehensive paper.

Menopon alternatum Osborn. Specimens of this species were found in small numbers on two black vultures, *Catharista urubu* (Vieillot), examined at Camp Pital.

Menopon balfouri Waterston. This species was present in all stages on five Swainson's toucans, *Rhamphastos swainsonii* Gould. It seems to be the prevailing species infesting these toucans.

Menopon ortalidis Carriker. Many males, females and immature specimens were collected from a curassow, *Crax globiceri* (Linnæus).

Colpocephalum kelloggi Osborn. A few males and females of this species were present on four black vultures, *Catharista urubu* (Vieillot).

Myrsidea extranea Carriker. A number of males, females and young forms were found upon three Swainson's toucans, *Rhamphastos swainsonii* Gould.

Myrsidea mirabilis Carriker. Several males and females of this species were collected from a Wagler's oropendula, *Zarhynchus wagleri wagleri* (Gray).

Læmobothrion glutianans Nitzsch. Several specimens of males and females of the large lice of this species were taken from three black vultures, *Catharista urubu* (Vieillot), examined at Camp Pital.

Trichodectes nasuatis Osborn. The small lice of this species were present in considerable numbers on each of three young coatis, *Nasua narica panamensis* Allen.

Goniodes aberrans Carriker. This species was found to be abundant in all stages on eight tinamous, *Tinamus major castaneiceps* Salvadori, that were eximined. Two of

these birds were taken at Camp La Vaca and six at Camp Pital. This species may be considered the most constant and the most numerous of the Mallophaga found in tinamou in Western Panama.

Goniodes laticeps Piaget. A few specimens in various stages of development were found on five out of eight tinamous, *Tinamus major castaneiceps* Salvadori, that were examined.

Goniodes minutes Carriker. Several specimens were collected from each of two tinamous, *Tinamus major castaneiceps* Salvadori.

Goniodes spinosus Piaget. A number of males and females of this species were taken from two tinamous, *Tinamus major castaneiceps* Salvadori, at Camp La Vaca.

Kelloggia brevipes Carriker. Taken in considerable numbers from each of eight tinamous, *Tinamus major castaneiceps* Salvadori, examined.

Ornicholax robustus Carriker. Present in small numbers on each of six tinamous, *Tinamus major castaneiceps* Salvadori, examined.

Philopterus cancellosus Carriker. Several males and females were collected from a Swainson's toucan, *Rhamphastos swainsonii* Gould.

Degeeriella francisi Carriker. This species was represented by six specimens taken from a Wagler's oropendula, *Zarhynchus wagleri wagleri* (Gray), at Camp Pital.

Esthiopterum assesor Giebel. This appears to be the predominating species of Mallophaga found upon the black vultures, *Catharista urubu* (Vieillot). Four of these birds were examined at Camp Pital and each yielded many specimens.

Esthiopterum columbæ Linnæus. One specimen was found on a Cassin's dove, *Leptotila cassini cassini* (Lawrence), at Camp Pital.

Esthiopterum tinami Carriker. One female of this species was taken from a tinamou, *Tinamus major castaneiceps* Salvadori.

Although these records of ticks from Chiriqui represent only seven species, probably only a small part of the total number present, they include two species which do not seem to have been recognized in Panama previously.

Ixodes ricinus (Linnæus). A number of males and females were collected from a forest deer, *Mazama sartorii reperticia* Goldman, killed near Camp Pital.

Dermacentor nitens Neumann. Several specimens of this tick were taken from a horse at Progreso by Dr. Clark. Since this species is commonly found on horses in many parts of Panama it is undoubtedly abundant throughout Chiriqui.

Amblyomma cajennense (Fabricius). One of the native hunters found an unengorged female of this species crawling about on him soon after his return from a trip in the forest near Camp Pital. Several specimens were also collected from a horse at Progreso by Dr. Clark. It is probable that this species is as ubiquitous in Chiriqui as in other parts of Panama.

Amblyomma cœlebs Neumann. A dead female of this species was found in the bag in which a spectacled owl, *Pulsatrix perspicillata* (Latham), had been placed a short time previously at Camp Pital. The tick was quite dry and it is possible that it may have been carried on the feathers of the bird from some nest or dead host. Two females were also taken from a horse at Progreso by Dr. Clark. One of these, partly engorged, was more than 11 mm. in length. This appears to be the first record of this species in Panama.

Amblyomma mantiquirense Aragao. A number of males, females and engorged nymphs were collected from a collared peccary, *Pecari angulatus crusnigrum* (Bangs), that was killed near Camp La Vaca. This seems to be the first occasion on which this species has been found in Panama.

Amblyomma oblongoguttatum Koch. This species was found to be present in abundance upon a collared peccary, *Pecari angulatus crusnigrum* (Bangs), that was killed near Camp La Vaca. Numerous males, females and nymphs were

also taken from a forest deer, *Mazama sartorii reperticia* Goldman, killed near Camp Pital.

Amblyomma ovale Koch. A female of this species was found crawling about on a titi monkey, *Saimiri orstedii orstedii* (Reinhardt), when the latter was removed from the bag in which it had been placed two or three hours earlier. Since this tick was not attached and contained no blood it is believed that the monkey was only an accidental host.

Trombicula dunni Ewing. The mites, or "red bugs," of this species were present in great numbers upon two agoutis, *Dasyprocta punctata nuchalis* Goldman, and three coatis, *Nasua narica panamensis* Allen, at Camp Pital. They were scattered in small groups over nearly all parts of the agoutis with additional large masses appearing as bright red spots, nearly 10 mm. in diameter, on either side of the upper and lower jaws, along the edges of the ears and at various places on either side of the body over the ribs on both these animals. One of them also had one of the masses beneath its chin. They were not so abundant on the coatis and were confined mostly to large masses on both ears of each of the animals. One of these coatis also had a large patch of the red bugs located on the dorsal line about midway of its back. These mites proved to represent a new species and were named and described by Ewing.

I wish to express my thanks and appreciation to Dr. H. C. Clark, for his aid in collecting many of the specimens, and also to Dr. C. T. Greene, Dr. J. Bequært, Dr. O. Krober, Dr. G. F. Ferris, Dr. H. E. Ewing, Dr. Karl Jordan and Dr. F. W. Edwards for their kindness in identifying many specimens of the various groups for me.

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REVIEW.

Studies in North American Trichoptera, 1.

By Lorus J. Milne, Cambridge, Mass., April, 1934; 19 pp., small 8vo. (For sale by author, 50c, postage extra; Biological Institute, Harvard Univ., Cambridge, Mass.).

This includes keys to the North American genera and species of *Phryganeidæ, Molannidae* and *Leptoceridae,* check-lists of world *Phryganeidae* and *Molannidæ* and of North American *Leptoceridæ,* in each case with only the North American synonomy. Three new genera, five new subgenera, three new species, four new subspecies and one new name are proposed; five old genera are resurrected, nine types of old genera are elected and thirty new North American synonyms are quoted, from a study of the type material in the Museum of Comparative Zoology, of Hagen's and Banks' names.

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DESCRIPTIONS OF THREE NEW NORTH AMERICAN ANTS WITH CERTAIN ECOLOGICAL OBSERVATIONS ON PREVIOUSLY DESCRIBED FORMS

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Myrmica (Manica) parasitica sp. nov.

Worker: Length; 5 mm.

Head exclusive of the mandibles quadrate, as broad as long, the sides and occipital border feebly convex, the occipital angles broadly rounded. Anterior border of the clypeus entire, angular, the portion in front of the median lobe flat, the lateral portions at either side straight but receding toward the insertions of the mandibles. Median lobe of the clypeus strongly convex in two planes, sharply separated from the large, triangular frontal area. Mandibles large and powerful, the external border rather feebly convex except near the tip where it turns inward sharply. Masticatory margin armed with a long, sharp and rather thin terminal tooth and a much shorter and stouter subterminal tooth; the remainder of the masticatory margin bearing 12 - 15 small teeth. Frontal carinæ short, thick, bluntly pointed in front and rather widely separated. Antennal scapes short and rather thick, strongly and abruptly curved at the base; in repose the tip of the scape surpasses the occipital border by an amount less than its greatest thickness. First funicular joint longer than broad and somewhat broader than the adjacent joint, joints 2 - 6 gradually increasing in diameter and length, the four apical joints

together form a distinct club whose maximum diameter is about three times that of the preceding joints. Eyes oval, moderately convex, set at the middle of the side of the head.

Thorax in profile with the promesonotum rather feebly convex, the promesonotal suture not impressed. Mesoepinotal suture prominent but with a shallow impression on the thoracic dorsum which is principally due to the elevated anterior edge of the epinotum since the posterior face of the mesonotum slopes directly to the suture without any impression. Epinotum in profile with a very feebly convex basal face which passes to the shorter declivious face through a poorly marked and very wide angle. In some specimens the angle between the two faces is virtually eliminated so that the profile of the epinotum is a single, convex, descending slope. Seen from above the promesonotum is pyriform and only a little wider than the subpentagonal epinotum. The sides of the thorax are only slightly constricted at the mesoepinotal suture.

Petiole seen in profile with a node which is very low, broadly and evenly convex above and without sharp transitions to the anterior or posterior peduncles. The ventral tooth on the anterior peduncle is very variable in character, In some specimens it is reduced to an angle, in others it has the form of a blunt, short tooth, in still others it is a very long and slender recurved spine. Dorsum of the postpetiole in profile with a long, sloping, feebly convex anterior face and a very short vertical posterior face. Ventral surface of the postpetiole in profile evenly convex. Seen from above the petiole is narrow and spindle shaped with the anterior peduncle slightly thinner than the posterior peduncle. The postpetiole has the form of a truncated cone with the sides convex. It is a little less than twice as wide as the node of the petiole.

Gaster bulky, oval.

The sculpture of this insect, particularly that of the head, shows considerable variation. In some specimens the entire head is covered with fine, longitudinal striæ. The more

lateral of these curve downward under the antennal fossæ and are carried forward to the insertion of the mandible. In such specimens the head is feebly shining with a semi-matte appearance. In other specimens the striæ are almost entirely absent being represented by a few on the posterior parts of the frontal carinæ and others on the side of the head between the eye and the insertion of the mandible. In such specimens the remainder of the head is highly glabrous with numerous, small piligerous punctures. The same variability is true to a lesser extent of the thoracic sculpture. In some specimens the entire thorax is covered with fine punctures which grade into longitudinal striæ on the pleuræ. Such specimens are feebly shining. In other specimens the whole thorax is highly glabrous, entirely without sculpture except for a few feeble lines or punctures at the base of the pleuræ, The sculpture of the petiolar nodes is more constant since even in the heavily sculptured individuals, these are in large part glabrous. Abdomen smooth and shining with fairly numerous small piligerous punctures.

In color and pilosity the insect is more uniform. The head is piceous with the mandibles a somewhat more brownish black and having a wide band of sordid yellow extending along the masticatory margin. Thoracic dorsum blackish brown, the pleuræ of the pronotum clear, brownish yellow, the pleuræ of the mesonotum and epinotum a clear brown which is somewhat lighter on the declivious face of the epinotum. Petiolar nodes blackish brown. Abdomen a darker brown than the petiolar nodes but not as black as the head. The entire insect covered with rather long, slender, curved hairs which are pointed, erect and yellowish in color. These are most abundant on the head particularly on the ventral surface where they form poorly developed gular ammochætæ. Flexor surface of the femora with a row of stiff, erect bristles. Extensor surface of the femora, tibiæ, tarsi, antennal scapes and the proximal half of the funiculi covered with small, fine reclinate hairs. Clubs of the funiculi pubescent.

Host: *Myrmica* (*Manica*) *bradleyi* Wheeler.

Types in my collection and in the collection of Dr. W. M. Wheeler.

The series of workers upon which this species is based was taken on the summit of Polly Dome (elevation about 8600 feet), a small dome adjacent to Tenaya Lake on the Tioga Pass road in the upper part of Yosemite National Park, California. Because of glacial action the domes have precipitous sides planed to a high degree of smoothness. It is actually possible in certain lights to see a glaze on the surface, which resembles that of a polished terrazzo floor. Naturally, the domes themselves are not good areas for collecting since there is very little soil present and when any does occur it is usually in pockets of coarse gravel and sand not suitable for nest making. Despite such unfavorable conditions the nest containing the new species was found in one of these gravel pockets. When first discovered only five *parasitica* workers were taken since, at that time, the author had nothing with which to excavate the nest. These five workers together with a number of workers of the host, *bradleyi,* were taken back to camp alive and the relations between the two species observed. These were to every appearance perfectly normal, the *parasitica* workers taking their share of the activities and being treated as ordinary nest mates by the *bradleyi* workers. The following day the author returned to the nest site and excavated the entire gravel pocket, luckily a small one, down to bed rock. Eight more *parasitica* workers were secured but no queen of any kind was seen. I am of the opinion that she may have moved to a safer place following the initial disturbance of the nest since, due to the ease and completeness with which the gravel could be removed and sorted, it is curious that she should have been missed had she been present. The failure to find the queen is much to be regretted since her structure might have shed some light on the type of relation between the host and *parasitica.* As the matter stands at present it is impossible to state with certainty whether the new species

is a slave maker or a temporary social parasite. In view of the fact that *parasitica* is smaller than *bradleyi* and has no mandibular specialization which might offset this disadvantage it seems more likely that the new species is a temporary social parasite.

Because of the close correspondence of general morphological characteristics it can scarcely be doubted that *parasitica* has been derived from *bradleyi.* It differs from *bradleyi,* however, in the following respects: the epinotum is lower and less angular, the node of the petiole is lower and more rounded, the sculpture is more feeble as even the most heavily sculptured individuals of *parasitica* never approach the heavy sculpture characteristic of *bradleyi,* the thorax and petiolar nodes are black (reddish yellow in *bradleyi*), the hairs are stouter, more uniformly erect and considerably more numerous on the ventral surface of the head.

Aphaenogaster (Attomyrma) huachucana sp. nov.

Worker: Length: 4.5-7 mm.

Head exclusive of the mandibles one and one half times as long as broad, the sides subparallel in the anterior two-thirds but narrowing sharply in the posterior third. Occipital border flat, less than half as wide as the greatest width of the head and bordered by a narrow but very distinct reflected flange. Clypeus moderately projecting, the anterior border sinuate with the median impression in some specimens broad, shallow and evenly concave, in others deeper, and more narrow with a distinct notch in the middle. Median lobe of the clypeus rather flat, ecarinate, not sharply marked off from the lateral portions and with an evenly rounded posterior border between the frontal carinæ. Frontal area only slightly depressed, shining with a prominent median carinula. Mandibles slender, the external margin straight except near the tip where it turns inward sharply and is convex. Outer third of the masticatory margin armed with three prominent teeth which decrease in length from the terminal tooth inward, the remainder of the mas-

ticatory margin irregularly serrate. The straight inner margin of the mandible meets the masticatory margin at a sharply marked angle. Eyes oval, of moderate size and rather strongly convex with their posterior borders lying slightly in front of the middle of the side of the head. Frontal carinæ prominent and subparallel, their lateral portions in the anterior half turned upwards so that from above this part of the carina appears narrow and welt-like. Antennal scapes long, slender and evenly though slightly curved outward. In repose they surpass the occipital border by one-third their length. The base of the scape is strongly spatulate. Funiculus filiform, joints 1 - 7 all of about the same length and diameter and all several times longer than broad, joints 8 - 12 somewhat broader than the preceding joints and slightly increasing in diameter apically.

Dorsum of the pronotum in profile feebly convex. Just posterior to the promesonotal suture the mesonotum is abruptly elevated. This elevated portion, which is flat on top, occupies the anterior half of the mesonotum and passes to the posterior half through a short and abruptly descending declivity. The posterior half of the mesonotum, which is also flat on top, is slightly if at all higher than the adjacent portion of the epinotum from which it is separated by a narrow U-shaped impression at the mesoepinotal suture. Epinotum in profile angular, the basal face, which is straight and slopes slightly to the rear, twice as long as the almost perpendicular declivious face. The angle between the two faces is armed at either side by a short, rather blunt tooth with a very wide base. Seen from above the pronotum is subpentagonal with the lateral portions carried back past the anterior half of the mesonotum so that the latter has the appearance of being a part of the pronotum. Just behind the pronotum the sides of the mesonotum are slightly constricted. There is no constriction of the sides at the mesoepinotal suture other than the very shallow incision formed by the suture itself. Seen from above the dorsal face of the epinotum bears a shallow longitudinal sulcus extending

backwards between the teeth. This sulcus is bordered at either side by a ridge which extends forward from the base of each tooth.

Node of the petiole in profile with a straight, sharply sloping anterior face which meets the anterior peduncle at a wide but well-marked angle. Summit of the node blunt, the posterior face slightly convex and steeply descending to the very short posterior peduncle. There is no ventral tooth on the anterior peduncle but a narrow lamella runs almost its entire length. Postpetiole in profile notably larger than the node of the petiole, its dorsum consisting of a long, sloping anterior face, a rounded summit and a shorter and more declivious posterior face. The ventral face of the postpetiole is straight or feebly sinuate. Seen from above the node of the petiole is subcircular, about twice as wide as the anterior peduncle and a little more than half as wide as the pyriform postpetiole.

Gaster rather small, oval.

Mandibles moderately shining, covered with fine and somewhat irregular longitudinal striæ. Entire head, except for the frontal area and the antennal fossæ, feebly shining or dull, coarsely reticulo-rugose with the interrugal spaces finely granulose. Just above the insertion of the mandibles and on the clypeus the granulation is more feeble than elsewhere. In some specimens the median lobe of the clypeus lacks the granulation altogether. Antennal scapes finely and densely punctate. Thorax densely and rather more coarsely granulose than the head. In certain lights feeble rugæ may be seen on the thorax, especially on the epinotum where they are most prominent. None of them, however, are nearly as well developed as those on the head. Petiolar nodes finely granulose. Abdomen glabrous with exceedingly fine, piligerous punctures.

Hairs moderately numerous, rather short, coarse, golden, erect and somewhat obtuse. About equally numerous on all parts of the body. Femora with short, rather sparse, erect hairs: those on the tibiæ and tarsi more numerous, finer and

suberect or appressed. Antennal scapes with numerous, very fine, appressed hairs; those on the funiculi longer, stouter and suberect except on the four terminal joints where the erect hairs are replaced by pubescence.

Color: head, thorax and petiolar nodes rich reddish brown to yellowish brown; the mandibles, legs and abdomen brownish yellow to clear yellow.

Described from a series of ninety workers taken in Ramsey Canyon, Huachuca Mountains, Arizona, at an elevation of 7000 feet.

Types in my collection and in the collection of Dr. W. M. Wheeler.

There can be little doubt that *huachucana* is closely related to *texana,* particularly to the variety *furvescens* Wheeler. Despite the fact that *furvescens* was originally described from material taken in Ramsey and Miller Canyons in the Huachuca Mountains I have no hesitancy in regarding *huachucana* as a distinct species since the structural peculiarities which it shows are reinforced by pronounced ecological differences. On the basis of structure the most obvious difference in the two species lies in the greater size of the new form (4.5-7 mm. in *huachucana,* 4-5.5 mm. in *furvescens*). In addition the head of *huachucana* is of a different shape. This is due largely to the fact that the sides in the narrowed posterior third are less convex, the occipital border narrower and the flange which borders the latter more pronounced in the new species. The antennal scapes in *huachucana* are notably longer than those of *furvescens* and are strongly spatulate at the base, a feature not present in the scape of the latter form. In the thorax of *huachucana* the anterior half of the mesonotum is more sharply set off from the adjacent portions of the thorax, particularly behind where there is a definite descending posterior face not found in the thorax of *furvescens.* The character of the epinotal spines is quite different in the two forms. In *huachucana* these are short and very broad at the base so that they are more aptly regarded as angular

teeth than spines. In *furvescens* the spines, while only slightly longer than those of *huachucana,* are slender throughout and not tooth-like. Finally the sculpture of *huachucana* is uniformly heavier than that of furvescens.

The ecological differences are equally distinct. The nest from which the types of *huachucana* were secured was situated at the base of a rocky ledge above a very steep slope on the western side of the canyon. The arrangement was such that the nest was in the shade for the greater part of the day. The elevation, as has been already noted was 7000 feet. I have taken many colonies of *furvescens* both in Ramsey and Miller Canyons. These were invariably under stones in sunny situations not far removed from the stream bottom and at elevations not exceeding 6000 feet. Finally the actions of *huachucana* are quite different from those of *furvescens.* The insects are slow, one might almost say clumsy, in movement even when excited, a marked contrast to the active and energetic workers of *furvescens.*

On the last day of May 1932 one of my students, Mr. Solomon Friedland, while collecting along the top of the Palisades near Englewood, N. J. had the good fortune to secure a single female belonging to the genus Anergates. At that time I considered the insect identical with the European *atratulus* but subsequently, through the generosity of Dr. W. M. Wheeler, I have been enabled to compare it with specimens of *atratulus* collected by Dr. Wheeler in Switzerland. This comparison has revealed a surprising number of significant differences and I now feel that the insect taken by Mr. Friedland must be regarded as a new species. Mr. Friedland's discovery is of twofold interest for it not only gives us first record of Anergates in the New World but also furnishes important data on the distributional status of the host species *Tetramorium cæspitum.* This matter is discussed in detail at the end of the following description.

Anergates friedlandi sp. nov.

Female: Length: 2.2 mm. (the gaster not expanded)

Differing from the female of *atratulus* in the following characteristics:

The single mucronate point with which the mandible is armed longer and stouter; the convex masticatory border of the mandible very feebly serrate (smooth in *atratulus*). Eyes nearly circular in outline and strongly convex with rather fine facets (oval and moderately convex with coarse facets in *atratulus*). Lateral ocelli small and so placed that they are hidden when the head is viewed from directly in front by the rectangular occipital crest on which they are borne (lateral ocelli larger and distinctly visible from the front in *atratulus*). Antennal scapes slightly and evenly curved outward, gradually increasing in thickness from base to apex and in repose surpassing the occipital border by an amount equal to the greatest thickness (in *atratulus* the scapes are almost straight, thickest at a point about three-quarters of the distance to the apex and in repose surpassing the occipital border by an amount less than their greatest thickness). Seen from above the epaulet-like lateral portions of the pronotum are strongly concave, blunted behind and set off from the median portion of the pronotum by a rounded welt or ridge (in *atratulus* the lateral portions of the pronotum are only slightly concave, rather sharp behind and set off from the median portion of the pronotum by a sharp ridge). Scutum longer than in *atratulus* and with more overhang at the anterior edge. The posterior portion of the scutum is evenly depressed all the way across including the paraptera so that there is a sharp transition to the scutellum when the thorax is viewed in profile (in *atratulus* the depression of the scutum is median only, the paraptera not being depressed, so that there is a sort of a shallow trough formed on the dorsum of the thorax; however in profile the transition between the scutum and scutellum appears less abrupt because of the elevation of the paraptera above the level of the middle of the scutum). Scutellum narrower and much more convex than in *atratulus*. Epinotum seen from above with the lateral projections less prominent and

more rounded than in *atratulus*. Seen from behind the broad longitudinal impression on the posterior face of the epinotum is broadly rounded above (narrower and rather pointed above in *atratulus*). Seen in profile the node of the petiole has a definite, short posterior face, a rounded and rather narrow summit and a long steeply sloping anterior face. Although both posterior anterior peduncles are short both are distinctly visible in profile and sharply set off from the node (in *atratulus* the node of the petiole is much bulkier with the dorsum broad and obtusely angular. The anterior and posterior peduncles are so short as to be virtually invisible when seen in profile). Postpetiole seen from above thinner from front to back than in *atratulus* with the anterior edge much less convex. The dorsum bears a shallow, median longitudinal sulcus (entire in *atratulus*). Abdomen with a deep median sulcus as in *atratulus*.

Sculpture very finely and evenly punctato-rugose except the very deeply notched clypeal border, the mandibles and the appendages which are shining. The sculpture is uniformly heavier than in *atratulus*, particularly on the posterior abdominal segments where it renders the surface definitely opaque (feebly shining in *atratulus*).

Color: head and thorax blackish brown, gaster a somewhat clearer brown, appendages dirty yellow. Wings hyaline, covered with numerous small hairs, the veins and stigma pale yellow.

Type in my collection.

It is much to be regretted that this interesting insect is known only from a single specimen. Following Mr. Friedland's discovery I returned with him to the type locality, a small meadow at the side of U. S. Highway No. 9 about three miles north of Englewood, N. J. In this place there are many nests of *Tetramorium cæspitum* constructed in coarse, gravelly soil along the sides of a fill over which the highway runs. Although we examined a number of the nests and although, during the following spring, the site was revisited for more extensive observation, no additional specimens

have been taken. This is scarcely surprising in view of the rarity of the European *atratulus*.

As has already been mentioned the presence of Anergates in North America presents some points of peculiar interest. In the Old World *Anergates atratulus*, a workerless parasite with degenerate, pupoidal males, is known to occur only in the nests of *Tetramorium cæspitum*. There is no reason to suppose that the American species possesses a generically different host. However it has been generally held that the presence of *Tetramorium cæspitum* in this country has come about through introduction from Europe. In point of fact there is more than a little evidence in favor of such a view. In 1905 when Dr. W. M. Wheeler published a list of the ants of New Jersey (1) he outlined the range of *T. cæspitum* as follows: "It occurs northward and eastward of New York as far as the Connecticut boundary, westward as far as Philadelphia and southward as far as Virginia." In subsequent years Dr. Wheeler published two other faunal lists dealing with New England species. The first of these (2) which appeared in 1906 covered all the New England states. In this paper there is a single record of *cæspitum* based on material taken by Dimmock at Springfield, Mass. The second of the lists mentioned above (3) appeared in 1916 and dealt with Connecticut only. In this paper Dr. Wheeler stated that *cæspitum* must certainly occur in Connecticut but he added that at the time of publication he had no actual records of the insect from that state. In 1927 Dr. Wheeler, reported (4) the first appearance of *cæspitum* in metropolitan Boston, In the same year I found several colonies of this ant along the paths of the Arnold Arboretum in Forest Hills. I have subsequently received specimens from Dr. Geo. Tullock taken at Bridgewater, Mass. Since *cæspitum* is by no means an obscure ant it follows that the virtual absence of New England records prior to 1929 can scarcely be credited to oversight on the part of collectors. For this reason its appearance in the vicinity of Boston in 1928 may be regarded as a migrational ingress. This is entirely in keeping with

the character of an introduced species but is not easy to explain in the case of a native form.

All of the above evidence is, of course, negated by the discovery of an American species of Anergates. Under these circumstances to continue the belief that *Tetramorium cæspitum* is an introduced ant necessitates the assumption, that when introduced a nest of *cæspitum* contained specimens of Anergates and since the time of introduction Anergates has undergone sufficient change to rank as a separate species. The author finds neither point tenable and is therefore prepared to regard *cæspitum* as a native member of our North American ant fauna. This bears out evidence presented by two of Emery's earlier records for *cæspitum,* one from Tennessee, the other from Nebraska. These records were always troublesome to the older view of *cæspitum* as an introduced species since both lie well beyond the eastern range of the ant and are separated from it by areas in which *cæspitum* apparently does not occur. Such a distribution need occasion no remark in the case of a native form.

One additional point may be considered here. It is possible that the insect which we now regard as the North American representative of *Tetramorium cæspitum* may not be cospecific with the European form. As far as the author can ascertain there are no differences of specific significance but since *cæspitum* shows a number of variants in Europe it is difficult to make a positive statement in this regard. However, even should the North American *Tetramorium* prove identical with one of the European forms of *cæspitum* its status as a native ant remains unaltered. One need only cite the case of *Formica fusca* to furnish an example of a holarctic host which supports specifically different parasites in the Old and New Worlds and whose distribution cannot possibly be the result of introduction.

ECOLOGICAL NOTES.

(1) An unusual slave of *Formica sanguinea* subsp. *puberula* Emery.

During the summer of 1933 the writer had the opportunity of collecting in the La Sal Mountains in southeastern Utah, an excellent region of unusual scenic beauty. The area worked was in the vicinity of the Warner Ranger Station which is situated on the northwestern side of Mount Allen at an elevation of about 9500 feet. Most of the collecting was done at the upper edge of a sage brush area which covers a large part of the top of Wilson Mesa. At the elevation just mentioned the sage brush is stunted in size and occurs on exposed ridges between which there are valleys filled with aspen trees. In this aspen-sage brush association one of the most abundant ants is *Formica sanguinea* subsp. *puberula* Emery. Of the many colonies of this insect which the author examined one was unique in containing specimens of *Formica microgyna* subsp. *rasilis* Wheeler as slaves. In addition a second slave, *Formica cinerea* var. *altipetens* Wheeler, was present. This second slave need cause no comment since other forms of *cinerea* have been previously reported as enslaved by *puberula*. So far as I am able to determine, however, there is no previous record of the enslavement of any member of the *microgyna* group.

It may be seen that there are two explanations for the formation of the colony just described. The simplest assumption is that the *rasilis* workers had been brought into the nest as a result of dulosis. On the other hand, since *rasilis* is known to be a temporary social parasite, it is possible, though not likely, that the colony might have arisen through the simultaneous entry of a female of *puberula* and one of *rasilis* into the original *altipetens* colony. A thorough excavation of the colony lead to the finding of two females of *puberula* but no female of *rasilis* was seen. In this case I feel that it is permissible to utilize the negative evidence resulting from her absence and state that the *rasilis* workers had been secured through dulosis since, less than a hundred yards from the excavated nest, I subsequently found a *puberula* colony engaged in attacking a nest of the typical *microgyna*. The *microgyna* nest was built at the base of a

small sage brush plant around the stem and lower branches of which the rather flat mound had been constructed. On the surface of the mound were numerous clusters of ants. Examination showed that these consisted of two or three *microgyna* workers industriously engaged in dragging away a worker of *puberula*. In no case did I see any dead raiders. Nevertheless the activities of the *microgyna* workers were effective if not lethal for, when their nest was opened, not a single raider was found inside.

Several interesting deductions may be drawn from the above data. In the first place it seems obvious that the *rasilis* workers present in the original *puberula* colony were obtained as the result of some unusual condition which enabled the raiders to enter a nest from which they would have ordinarily been excluded. In the second place we may safely conclude that the infrequent occurrence of members of the *microgyna* group in the nests of slavemakers is due to the defensive activities of the former and not to any discrimination on the part of the slave makers. This is entirely in keeping with the idea advanced by Dr. W. M. Wheeler (5) that the type of slaves which appear in the nests of dulotic species will be determined by the abundance and degree of docility of the enslaved species.

(2) The nest founding of *Formica ulkei* Emery.

While collecting in the Black Hills of South Dakota in September 1933 the author secured numerous specimens of *F. ulkei* Emery in the type locality, Hill City. Among these was a single female which had been adopted by a small colony of *Formica fusca*. It may be recalled that in his monograph of the genus Formica Dr. Wheeler postulated *fusca* as the temporary host of *ulkei* (6). The nest in which the female just mentioned was taken was a small one consisting of not more than three dozen *fusca* workers most of which were minims. It seems likely, therefore, that the nest-founding activities of *ulkei* differ in no essential respects from those of *exsectoides*, the female securing adoption by a depauperate queenless colony of the host species. It may be

added that in the neighborhood of Hill City the nests of *ulkei* are widely separated with little evidence for the formation of daughter colonies through migration. Further south, however, in the Custer State Park the author found areas in which there were several nests in close proximity. Although these multiple nest colonies are perhaps less numerous than the enormous groups formed by the eastern *exsectoides* there is ample evidence that *ulkei* does on occasion form daughter colonies by migration.

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MOSQUITO INVESTIGATIONS IN ALASKA

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During the summer of 1931 the United States Department of Agriculture and the United States Smelting Refining and Mining Company entered into a coöperative agreement in connection with investigations as to the "habits, biology and methods of control of mosquitoes in Alaska". The writer was employed by the United States Smelting Refining and Mining Company to carry on the investigations under the technical direction of F. C. Bishopp of the Bureau of Entomology. The investigations were carried on in the vicinity of Fairbanks, Alaska, with headquarters at the Fairbanks Exploration Company, a subsidiary of the United States Smelting Refining and Mining Company. Laboratory quarters (Fig. 1) were located at Fox, eleven miles northeast of Fairbanks.

The purpose of the investigations was to determine if practical control methods could be suggested which would reduce the annoyance of mosquitoes to men engaged in gold mining operations. In this region workmen must protect themselves from the attacks of these pests. Nets (Fig. 2) and gloves or similar means of protection (Fig. 3) serve this purpose during the periods in which mosquitoes are abundant. Although mosquito investigations have been carried on in many parts of the world, it is believed that this was the first attempt to study the control of mosquitoes in a practically arctic environment.

The area in which the investigations were carried on lies between 64°-10' and 64°-50' north latitude and between 147°-20' and 147°-20' and 147°-50' west longitude in the Yukon-tanana region which forms a part of the central plateau of Alaska. Mr. James Crawford, research engineer of the

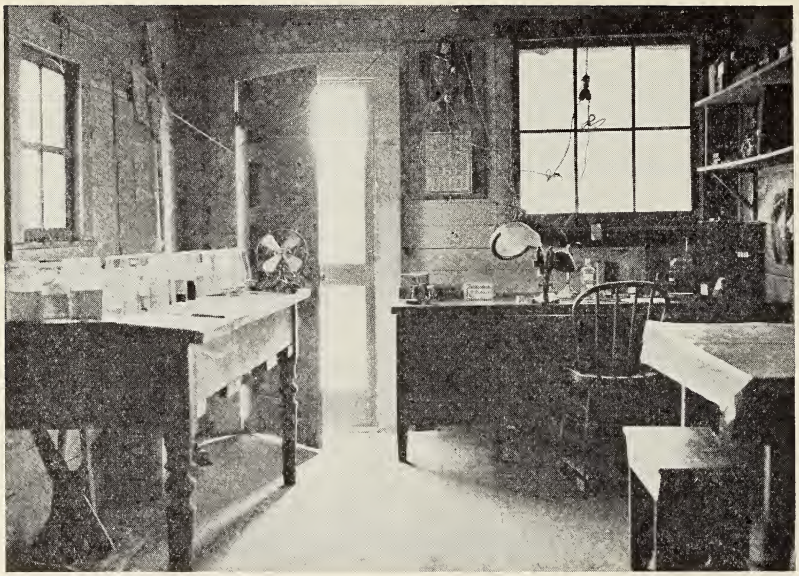

Fig. 1. Laboratory Quarters at Fox, Alaska

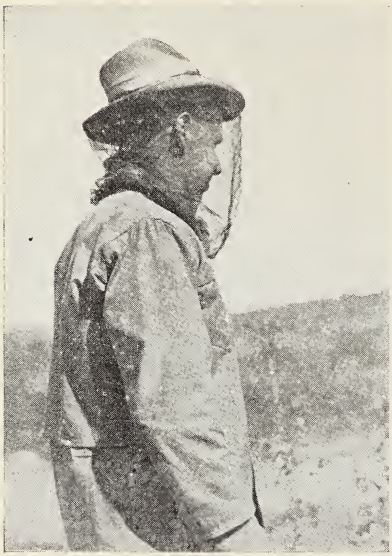

Fig. 2. Net used as protection against mosquitoes

Fig. 3. Use of gloves as protection against mosquitoes

Fairbanks Exploration Company, has described the general region as follows:

"The region may be described as a plateau, with bed rock composed predominantly of schists, which has been cut by numerous streams and their tributaries. Comparatively broad unsymmetrical valleys with broad interstream areas are characteristic. Isolated prominences, locally known as

Fig 4. Characteristic view of country in the region where mosquito investigations were made

domes, which are composed of igneous rocks and owe their presence to the resistance of such rocks to weathering, rise above the general level of the neighboring ridges (Fig. 4). The average elevation of the ridges is around 2000 feet above sea level, while that of the valleys varies from 470 feet at Fairbanks to 940 feet in the valley of Goldstream at Gilmore."

"The region has been subjected to long continued and intricate stream modeling and since it lies outside the area of

glaciation, its topography is due almost exclusively to stream erosion. A mantle of 'muck', in part decomposed organic material, covers the hillsides and the unconsoligated gravel deposits in the valleys. This mantle is in turn covered by varying thicknesses of moss on the hillside, which is combined with bunch grass, locally known as 'niggerheads' in the valleys. Spruce trees grow extensively on the side hill while clumps of birches, willows and alders are found in the valleys. Since the ground is permanently frozen over large areas and during the summer thaws to shallow depths only, the trees are for the most part stunted."

"The drainage in the area is controlled by the Tanana, the chief streams being the Chatanika, Goldstream, and the Tanana. Most of the tributaries head at about the same elevation, have about the same grade and carry approximately the same amount of water. The courses of the small tributary streams are well defined and definite throughout their lengths, however, drainage conditions in the flat portion of the valleys traversed are poor, due in part to frozen ground and vegetation. In most of the valleys shallow swamps interspersed with 'niggerheads' stand above the general elevation of the stream. In the broad valleys such as those of the Chatanika and Goldstream, large areas of such swamps are present. * * * *."

The climate of the interior of Alaska is characterized by extremes in temperature and light precipitation. The so-called "interior" of Alaska is the drainage system of the Yukon River with its tributaries, the Koyukuk, Chandalar, Tanana, Kantishna and Porcupine Rivers. This region lies well to the north of the Gulf of Alaska and the Aleutian chain of islands. It is well known that the vicinity of The Alaska Peninsula is a continuous low pressure area and a breeding place for storms. The cyclones and anti-cyclones occurring in this region move eastward across the Gulf and follow several established routes across the United States and Southern Canada. The offshoots from these lows rarely affect the climate of the interior, although they

cause storms and precipitation on the southern slopes of the Alaska Range. Occasionally a low pressure area will move through the interior, coming up from the Bering Sea. These give southerly winds throughout the interior. During the summer the heated interior of Alaska is conducive to low pressure areas of slight intensity which, in turn, induce precipitation.

The precipitation over the greater part of the interior is small. Around Fairbanks it averages from 10 to 14 inches. About 25% of this occurs in the form of snow. Normally the wettest months are July and August with June and September following. These four receive over half the year's precipitation. Over a period of 15 years the records show that the wettest years gave over twice the precipitation of the dry years. This disparity is due largely to the excess of rainfall in the summer months of the wet years and a deficiency of rainfall in dry years rather than marked changes from normal in other months. Around Fairbanks snow is usually gone by the last of April, although an occasional fall of snow in May or June is not uncommon. During the summer months rainfall is sometimes attended by mild thunderstorms and sometimes hail.

The summers of interior Alaska have delightful temperature conditions. They are warm enough for comfort, but are not oppressively hot. The long days and continuous sunshine cause rapid growth of vegetation. The highest temperature ever recorded over many years was 100° F. at Fort Yukon in July, 1915. The spring months have the highest percentage of possible sunshine and the late fall and the early winter months the least. Fairbanks averages 17 clear days in April and only 8 in September. Winter temperatures are as low as 75° F.

The situations in which mosquito larvæ were found developing fall into two fairly well defined categories. The first included those areas in which the water was present during the greater part of the summer while the second included those areas in which the pools were temporary in

nature. Prospect shafts and permanent swampy areas are included in the first category while the surface pools found in the moss and in the "niggerheads" are included in the second category.

The larvæ found to be peculiar to the permanent breeding areas represented two species, *Culiseta alaskænsis* and *Culex apicalis*. The larvæ of the first species appeared during the latter part of the season having developed from eggs laid by the overwintering females. The larvæ of the second species were found earlier in the season, having developed from overwintering eggs. The adults of *C. alaskænsis* although they were present in great numbers during the early part of the season of 1931 did not cause any great annoyance to the workmen.

The following species appear to be represented in the material collected during 1931:

TABLE I

1. *Anopheles maculipennis* Meigen	Adult
2. *Culiseta alaskænsis* Ludlow	Larva and Adult
3. *Culiseta impatiens* Walker	Adult
4. *Aëdes diantæus* H. D. and K.	Larva
5. *Aëdes communis* Felt and Young	Larva and Adult
6. *Aëdes fitchii* H. D. and K.	Larva
7. *Aëdes punctor* Kirby	Larva and Adult
8. *Aëdes aldrichi* Dyar	Larva and Adult
9. *Aëdes cyclocerculus* Dyar	Larva
10. *Aëdes leuconotips* Dyar	Larva
11. *Aëdes impiger* Walker	Larva
12. *Aëdes aboriginis* Dyar	Larva and Adult
13. *Aëdes stimulans* Walker	Larva and Adult
14. *Aëdes cataphylla* Dyar	Adult
15. *Culex apicalis* Adams	Larva and Adult
16. *Eucorethra underwoodii* Underwood	Larva and Adult
17. *Chaoborus trivittatus* Loew	Larva
18. *Corethra* sp.	Larva and Adult

The mosquitoes found to be developing in the temporary situations represented several species, many of which were troublesome. The water in these pools resulted from two sources, the more important of these being the melting of the snow. The subsequent accumulation of water in small pools provided excellent breeding places for the development of the larvæ from the overwintering eggs. The second source was not of as much consequence, being the result of the thawing of the frozen ground; the water rising to the surface and forming new pools or adding to the pools which had resulted from the melting of the snow. During some seasons it is possible that the rainfall during April and May may result in the formation of pools similar to those formed by the melting snow. Such a condition did not exist during 1931; water from rainfall acted in a contributory capacity, viz., replenished pools so that the water remained long enough to allow larvæ to complete their normal development.

Although the number of species present was rather large only four, *A. punctor, A. communis, A. aldrichi* and *A. stimulans* were present in large numbers. As far as is known, the life histories of these four species are very similar, the general description which follows being equally applicable to all. The eggs are laid in summer on moist or dry ground and remain unhatched until after having been exposed to winter cold. Early in the spring when rising temperatures cause the accumulated snow and ice to melt forming pools on the frozen ground, the eggs hatch and the first stage larvæ appear. During 1931 some larvæ reached maturity early in June, pupation being first noted on June 8. Adults of *A. communis, A. punctor,* and *A. aldrichi* appeared about the same time in the middle of June and were present in noticeable numbers throughout the same period (Table 2) during the season. *A stimulans* appeared somewhat later and was present in numbers throughout a longer period than the other three. Information pertaining to the distribution and relative abundance of these troublesome species was col-

lected by the timekeepers at four different stations in the gold dredging area. The method employed was to have each timekeeper make a five minute collection at the same time and the same place each day. Specimens were sent in for identification on Saturday of each week. The results from one of these collection points are tabulated below. These results are similar to others collected from other stations except in a few minor details.

TABLE II

Number of specimens of different species taken in five minute collections on man at Gilmore, Alaska.

Date	No. of specimens	Aedes communis	Aedes punctor	Aedes aldrichi	Aedes stimulans	Culiseta alaskaensis	Anopheles maculipennis	Unidentified*
6-17	20	4		6		1	1	**8**
6-18	11	7						4
6-19	16	5		1				**10**
6-20	3				1	2		
6-21	30	3	7		1			19
6-22	3							3
6-23	20					2		18
6-24	20	2						18
6-27	8		1					7
6-28	15	1			1	1		12
6-29	6				2			4
6-30	2				1			1
7-2	4				3			1
7-3	4			1	3			
7-6	8				5			3
7-7	7				5			2
7-8	4							4
7-16	3				3			
7-18	3				2			1
8-11	4				4			
8-12	2				2			
8-13	5				5			
8-14	4				4			
8-15	5				5			
8-16	4				4			
8-17	6				5			1

*Specimens damaged during collection.

Although no detailed study of the various natural factors controlling the abundance of mosquitoes was made, the following observations were made which indicated that considerable numbers of mosquitoes were destroyed by predacious insects and other enemies. Larvæ of Dytiscid and Hydrophilid beetles were abundant as well as backswimmers, all of which are known to be efficient enemies of mosquito larvæ. The predacious larvæ of three species of mosquitoes (Table 1) were found in large numbers and birds and amphibians reputed to prey upon the larva or adult mosquito were present also in this region.

It was a generally admitted fact that the mining operations themselves have aided in abating the nuisance from mosquitoes. The removal of the surface moss and muck and the dredging operations have reduced the extent of the breeding areas. The removal of brush has reduced the extent of the natural environment preferred by the troublesome adults and driven them away from the vicinity of the workmen. As a result of these two operations the conditions in certain localized areas have been improved greatly. At the conclusion of the investigation in 1931 specific recommendations were made relative to further improving the conditions near the mining operations.

As indicated before the major portion of the breeding during 1931 was in the pools in the moss and the niggerheads situated in the lower level portions of the valleys, These pools are usually covered partly or entirely with dead grass and moss from the previous year. The presence of this dead vegetation retards the evaporation of water as well as impedes the drainage. It was recommended that all the dead grass and moss around the operations be removed by burning during the spring of the year. This recommendation was prompted by the observation that an area of about one hundred acres which had been fired accidentally contained relatively few pools containing larvæ while in the adjacent unburned areas larvæ were abundant in the pools. Other recommendations included oiling and draining of

pools within 500 yards of the operations, the use of copper sulphate as a larvicide and the use of repellants by the workmen. Control work was carried on during 1932 under the direction of Mr. J. D. Crawford. In the report at the end of the season, Mr. Crawford recommended that the work be continued during the season of 1933.

TWO NEW NORTH AMERICAN ANTS

By M. R. Smith
State College, Mississippi

Recently I received for identification from Illinois, two species of ants which I believe to be new to science. One of these, a *Leptothorax,* was collected by Miss Mary Talbot at Plainsfield. To this species, which is characterized by its peculiar type of sculpturing, I have assigned the name *foveata.* The other new ant is a member of the *Lasius Acanthomyops* group. Workers of this species were collected at Herrin, by Drs. T. H. Frison and H. H. Ross. Although this ant has many characters that will set it apart from its cogeners, I have chosen the name *parvula* for it because of its unusually small size.

Dr. W. M. Wheeler confirms my opinion that both of these species are new.

Leptothorax foveata sp. nov.

Worker:—Length 2.43 mm.

Head moderately large, excluding the mandibles, noticeably longer than broad, with moderately convex sides, rounded posterior angles, and straight posterior border. Eyes large and prominent, oval, convex, placed near the middle of the sides of the head. Mandibles with 5 distinct teeth. Clypeus convex, with anterior border entire. Antennæ 11-segmented; scape lacking its greatest width or slightly more of attaining the posterior border of the head; first funicular segment longer than segments 1 and 2 taken together. Thorax short, robust, convex above; viewed dorsally the humeri are rounded, the pro-mesonotal suture very faintly visible, and the meso-epinotal suture only slightly more perceptible. Epinotal spines moderately long and robust, directed upward, outward and backward. Petiole viewed in lateral profile with feebly concave anterior sur-

face, faintly convex or flattened superior surface, which posteriorly rapidly descends toward the postpetiole. Postpetiole from above with convex node, which is very distinctly broader than long.

Head, thorax, petiole, and postpetiole, with foveate impressions, subopaque; those on the head much finer, especially on the front and vertex where they are intermingled with very fine longitudinal rugulæ; remainder of head, and dorsum of thorax, petiole, and postpetiole reticulate-foveate. Gaster glabrous, appendages very similar.

Head, thorax, petiole, postpetiole, and gaster sparsely covered with short, erect, clavate hairs of a grayish or light yellowish color. Pubescence very fine and appressed, extremely sparse, most easily discernible on appendages.

Color deep reddish brown or ferruginous brown, with lighter appendages and gaster. Eyes and mandibular teeth black.

Described from a single worker, the type of which is in my collection.

The type worker, and an abnormal worker specimen were collected by Miss Mary Talbot in the nest of *Aphænogaster fulva* subsp. *aquia* Buckley in a roadside ditch at Plainfield, Illinois on May 25, 1933.

This species is so different from all of the *Leptothorax* with which I am familiar that I am somewhat hesitant in trying to assign it to its proper taxonomical position. In Wheeler's key to the species of *Leptothorax* (Proc. Acad. Nat. Sci. Phila. p. 223, (1903) the specimen would apparently key down to the *acervorum canadensis* group. From *canadensis* the species can be distinguished by the following characters: (1) lack of a distinct longitudinal impression on the clypeus, (2) longer scape, (3) shorter thorax, (4) poorly developed pro-mesonotal and meso-epinotal sutures, and (5) differently shaped petiole and postpetiole.

The most striking characteristics to me are the unusually prominent eyes of the worker, as well as the peculiar type of sculpturing; the species has, therefore, been very aptly named *foveata*.

Lasius (Acanthomyops) parvula sp. nov.

Worker:—Length 3.0 mm.

Head, excluding the mandibles, only very slightly longer than broad, narrower in front than behind, and with straight or very feebly excavated posterior border and regularly convex sides. Mandibles, each with 6 to 7 very distinct teeth and some smaller, less defined denticulæ; the superior surface without teeth as with *L. interjectus*. Eyes extremely small, resembling somewhat those of *L. flavus* subsp. *nearcticus*, apparently with not more than 6 ommatidia in their greatest diameter. Antennal scapes short, scarcely if at all, exceeding the posterior border of the head. Petiole apparently lower and thicker than with *L. interjectus;* anterior surface convex, posterior surface flattened, and superior surface transverse, entire.

Body, and coxæ and femora of legs covered with rather abundant, moderately long, erect, pale yellowish hairs. Pubescence fine and appressed, sparsely covering all parts of body except the appendages.

Pale yellowish, especially the gaster, which is lighter than the other parts of the body.

Described from 4 workers, the cotypes of which are in my collection.

These ants were collected by Drs. T. H. Frison and H. H. Ross of the Illinois State Natural History Survey at Herrin, Illinois, on October 12, 1933. According to these gentlemen the ants were collected in the soil beneath a rotten log in an open wood lot. They were associated with *Lasius niger* var.

That this species belongs to the subgenus *Acanthomyops* is clearly indicated by the 3-segmented maxillary palpi of the workers. At a glance one would assign the species to *L. flavus nearcticus* because of the pale color, small eyes and general size of the workers. I believe this to be a perfectly valid species as evidenced by the following characters: (1) the extremely small size of the worker, (2) unusually small eyes, (3) very short antennal scapes, (4) lack of teeth on the superior surface of the mandibles, and (5) pale yellow color. This is apparently the smallest North American *Acanthomyops* that has yet been described.

THE EUROPEAN CORN BORER ON LONG ISLAND[1]

By S. M. Dohanian

Bureau of Entomology, U. S. Department of Agriculture

The land area of that part of New York State known as Long Island and composed of Kings, Queens, Nassau, and Suffolk counties, is 30 percent greater than that of the State of Rhode Island. Of the 878,720 acres of land on Long Island 126,108 acres were under cultivation in 1929 according to the latest available agricultural census. Long Island is about 120 miles long, its greatest breadth being 20 miles. An irregular range of low hills extends most of the length of the Island a little north of the center; south of this range the surface is comparatively level, while to its north hills and valleys predominate. The average elevation of the land along the north side is about 100 feet, there being only 4 or 5 hills with an altitude greater than 300 feet.

Outside of a considerable residential portion practically all of Nassau County, a large part of the townships adjacent to it on the east, and the entire eastern half of Suffolk County (where the soil permits) are under intensive cultivation. The chief products are potatoes, corn, cauliflower, lima beans, and various truck crops. The 1930 census figures show that 40,350 acres were planted to potatoes, 6,257 acres to field corn, and 4,957 acres to sweet corn.

The first infestation on Long Island by the European corn borer (*Pyrausta nubilalis* Hübner) was discovered in Kings County (Brooklyn) in August 1923.[2] The larvæ found

[1] "The Long Island Project," conceived by D. J. Caffrey, was started in 1927 by R. A. Vickery. R. E. Kimport continued the work from 1928-1930 under the direct supervision of Mr. Caffrey, in 1931 under B. E. Hodgson, and in 1932 and 1933 under A. M. Vance. Acknowledgement for helpful criticism in the preparation of this paper is due A. M. Vance, and D. W. Jones.

[2] During the period 1923-1928, unsuccessful efforts were made both by State and Federal agricultural authorities to eradicate the corn borer infestation in this and contiguous areas.

proved to be of the one-generation strain. In 1927 four townships (Southold, Shelter Island, Southampton, and East Hampton) at the extreme eastern end of the Island were found to be infested with the two-generation strain of the borer. The Bureau of Entomology, by establishing a field laboratory on the Island, took immediate advantage of the opportunity thus presented of studying the two strains of this pest simultaneously in the presence of extensive corn acreages and in a situation more or less typical of a large area along the Atlantic seaboard. The principal objective of this project, which was carried on in cooperation with the Bureau of Plant Quarantine, was to ascertain the sources of residual overwintering borer population that would form the nucleus of the reinfestation in the following spring.[3] Incidentally much information of a varied character was obtained which has led to a better understanding of the insect.

The easterly dispersion of the one-generation strain of the borer from the site of the original colony at the extreme western tip of the Island has been slow indeed. During the decade of its existence there the borer has invaded an average of only 4 miles of new territory each year. This seems a comparatively slow spread when the nature of the terrain, the general direction of the prevailing winds, and the abundance of corn are considered as factors exceptionally favorable for dispersion. Among the probable factors restraining a more rapid spread may be mentioned (1) the efforts at eradication practiced in this area from 1923 to 1928, inclusive, by the Bureau of Entomology in cooperation with the State of New York; (2) the absence of field corn on that end of the Island, which limits hibernating quarters for the borers; (3) the fact that the one-generation borer rarely attacks weeds, which also limits hibernating quarters; and (4) the fact that in this district, where considerable early sweet corn is grown for metropolitan New York markets, many of the cornfields are plowed under as soon as the ears have been harvested (while the stalks are still green and the corn borer larvæ within are in the immature feeding stages) preparatory to the planting of fall crops.

[3] The results of this investigation have been summarized in an unpublished manuscript by R. E. Kimport.

On the other hand, the westward spread of the two-generation strain of the borer from the eastern end of the Island has been more than twice as rapid. In 1927, Mattituck, on the north fork, and Southampton, on the south fork, formed the western limits of the two-generation infestation, while in the late summer of 1933 evidences of this strain were encountered as far west as Greenvale in Nassau County, a distance of about 60 miles. Consequently, there

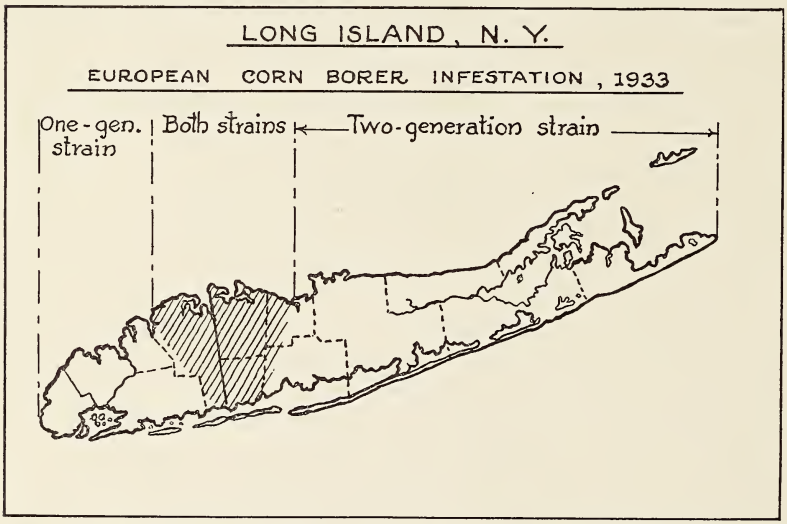

Fig. 1. Map showing distribution of both broods of the European Corn Borer on Long Island

exists (1933) an overlapping of the two strains in an area of approximately 275 square miles a little west of the center of Long Island. In the townships of Oyster Bay in Nassau County and Babylon, Islip, Huntington, and Smithtown in Suffolk County evidences of both the one-generation and the two-generation strains have been found.

Since 1928 annual "infestation surveys" have been made to determine the intensity of European corn borer infestations in corn in both the single-brood and the double-brood districts of Long Island. In the former the surveys were conducted in midsummer, while in the latter they were made

in the early fall after the second generation larvæ had become established in corn. There appears to have been a slow but steady increase in the borer population of the one-generation district from 1928 to 1933. The average number of borers per 100 plants was 1.2 in 1928, 2.4 in 1929, 3.4 in 1930, 13.4 in 1931, 5.5 in 1932, and 8.6 in 1933.

In the two-generation district the average number of borers per 100 plants was 128.5 in 1928, 50.9 in 1929, 65.7 in 1930, 401.9 in 1931, 394.4 in 1932, and 356.5 in 1933. It may be seen that previous to 1931 the infestation in Suffolk County was not heavy. The decided increase in numbers that occurred that year in the eastern half of the county, which has since been maintained, made it the most severely infested district in the entire area occupied by the two-generation strain of the European corn borer for the years 1931 and 1932. To illustrate the severity of infestation a cornfield may suffer, an actual case in Southold Township, on the north fork, may be cited. In 1931 this field showed a 100 percent plant infestation. The dissection of 10 infested plants, selected in accordance with a uniform method of sampling, gave an average of 57 borers per plant. The borer population of the field was therefore 5,700 borers per 100 plants. Seventy-four borers was the maximum number found in a single plant in this field. Undoubtedly a number of factors are responsible for the continued heavy infestation in the eastern half of Suffolk County. Not the least among these may be the enormous carry-over in potato plants of the first-generation borers, which afterward infest corn. Thousands of acres of both corn and potatoes are interspersed throughout the eastern half of Suffolk County.

The larvæ of the European corn borer have been found infesting 23 kinds of plants on Long Island, among which are vegetables, flowers, and weeds. A systematic survey of the Island would probably enlarge the following list of host plants compiled by R. E. Kimport.

Zea mays L. (corn).
Holcus sorghum L. (Sudan grass).
Echinochloa crusgalli (L.) Beauv. (barnyard grass).
Chaetochloa sp. (foxtail).

Iridaceae (iris family) : Gladiolus hybrids (gladiolus).
Rumex sp. (dock).
Polygonum hydropiper L. (common smartweed).
Rheum rhaponticum L. (rhubarb).
Chenopodium album L. (lamb's-quarters).
Beta vulgaris crassa Alef. (beet).
Spinacia oleracea L. (spinach).
Amaranthus retroflexus L. (pigweed).
Phaseolus vulgaris L. (kidney bean).
Phaseolus lunatus macrocarpus Benth. (lima bean).
Solanum tuberosum L. (potato).
Solanum melongena L. (eggplant).
Lycopersicon esculentum Mill. (tomato).
Cucumis sativus L. (cucumber).
Cucumis melo L. (muskmelon).
Cucurbita pepo L. (pumpkin).)
Ambrosia elatior L. (ragweed).
Dahlia pinnata Cav. (dahlia).
Arctium sp. (burdock).

According to B. E. Hodgson[4] eight of these plants are "true hosts," serving the dual purpose of food and hibernation. To date corn is the only plant known to suffer real commercial damage. Two other major crops of the area, however, although their yield is probably not seriously lowered by the European corn borer, are considered extremely important hosts. The first of these is the potato. This plant is attacked rather severely at times by the first-generation borer. For example, in 1933, in Suffolk County, potato plants harbored 51 first-generation borers per square rod to 99 borers in each square rod of corn. The liking which the European corn borer appears to have for the potato plant is of considerable significance in view of the fact that this plant serves as a convenient and very important carry-over host, thus furnishing moths of the first generation to attack corn and some of the late vegetable crops. Where corn and potatoes are planted in close proximity, danger of serious commercial damage to corn, and possibly also to potatoes, is greatly enhanced.

[4] Hodgson, B. E. The host plants of the European corn borer in New England. U. S. Dept. Agr., Tech. Bull. 77, 63 pp., illus. 1928.

The other important host plant is the lima bean. Although there is but little loss in yield from the attacks of the European corn borer on lima beans, this plant becomes a potential means of spread for the insect into noninfested areas, when its pods are transported into such territory.

The development of a severe infestaton in the two-generation district on the eastern tip of the Island, and its practical isolation from neighboring infestations, presented an excellent opportunity to demonstrate the extent and efficacy of control by parasites. Accordingly, during the summer of 1933 a total of 67,435 imported parasites of the European corn borer were liberated at carefully selected points in the eastern half of Suffolk County. In these liberations were represented 13 European and 3 oriental species, as shown in the following list:

Species	*Number of Individuals*
Apanteles thompsoni Lyle	126
Campoplex multicinctus (Grav.)	35
Campoplex pyraustae Smith	12
Ceromasia lepida Meig. (oriental)	278
Chelonus annulipes Wesm.	1,630
Cremastus flavoorbitalis (Cam.) (oriental)	233
Eulimneria alkae Ell. & Sacht.	696
Eulophus viridulus Thoms.	21,017
Inareolata punctoria (Roman)	3,686
Lydella stabulans var. *grisescens* R.D.	19,524
Macrocentrus gifuensis Ashm.	17,139
Microgaster tibialis Nees	2,804
Phaeogenes nigridens Wesm.	20
Phorocera erecta Coq. (oriental)	4
Zenillia mitis Meig.	99
Zenillia roseanæ B. & B.	132
Total liberated	67,435

Judged by their past ability to adapt and acclimatize themselves, and by the effective work they have done since their introduction into both the New England and the North Central State areas, it seems very probable that the

two parasites *Inareolata punctoria* and *Lydella grisescens* will be the first to become established and to prove beneficial on Long Island. In addition to the numbers of these two species liberated in 1933, as shown above, 1,229 individuals of *I. punctoria* and 5,916 of *L. grisescens* were colonized in the township of Southold, in the north fork, during the summer of 1932. Except for these two species, no parasites of the European corn borer, however, had ever been liberated on Long Island previous to 1933. A parasite census here four or five years hence should supply interesting results and useful information.

When the European corn borer invaded Long Island it seemed to have found ideal conditions in which to live and to thrive. Favorable weather conditions combined with the abundance of corn on the Island furnished an environment strongly in its favor. The absence of its natural parasites and diseases also aided its rapid increase. Paradoxical though it may seem, the farmers themselves unwittingly assisted its increase by failing to destroy the materials in which the borers hibernate. (New York State has not enacted the "compulsory corn borer clean-up" law in force in some of the New England States). The history of the European corn borer on Long Island has been such as to make the invasion by this insect an important economic problem not only for Long Island but also for other areas along the Atlantic seaboard where conditions are similar, and some of these are already infested.

AN ANNOTATED LIST OF THE ANTS OF THE SNAKE RIVER PLAINS, IDAHO (HYMENOPTERA:FORMICIDAE)

By A. C. Cole, Jr.
Twin Falls, Idaho

The ants of the Snake River Plains region, while comprising relatively few forms in comparison with other areas, are, however abundant in so far as the number of colonies is concerned. Floristically, the region is divided into (1) the vast semidesert plains of sagebrush, rabbitbrush, greasewood, shadscale and bromegrass; (2) the tall perennial grass upland habitats, in which grow the Agropyrons and Stipas and subalpine meadow vegetation; and (3) the mountainous and hilly areas, chiefly inhabited by western yellow pine, with juniper and alder at slightly lower elevations.

1. *Pogonomyrmex occidentalis* Cresson[1]

This is the dominant and most abundant ant of the semidesert areas. It usually builds pebble mounds with cleared surrounding area. Winged forms appear from late June to late July. Food consists of seeds of many plants although chiefly those of *Bromus tectorum* L. (Downy Bromegrass) when present. Crater nests of *Dorymyrmex pyramicus* are occasionally on the mound faces and in the denuded areas.

2. *Pheidole californica* Mayr.

This ant is abundant in sagebrush areas of the Snake River Canyon but decreases in number with northward progression, being only occasional in the tall grass meadows. It nests beneath rocks, usually on hillslopes. Colonies are rather populous. Soldiers are present, in proportion to workers about one to t Food consists chiefly of small seeds and some insects. ed forms appear in August.

[1]Determinations and checkings by Dr. M. R. Smith.

3. *Pheidole oregonica* Emery

P. oregonica occupies the same habitats as does *P. californica,* but its colonies are usually less populous.

4. *Leptothorax curvispinosus rugatulus* Emery

This ant is rather frequent in moist habitats near Twin Falls, Hagerman and Buhl, chiefly along the Snake River. Colonies are small, the workers timid and sluggish and the brood scant. Winged forms appear at Twin Falls in late September.

5. *Leptothorax eldoradensis* Wheeler

The species *eldoradensis* occurs in small numbers near Twin Falls, where it occupies small crater nests in moist areas.

6. *Monomorium minimum* Buckley

Occurring in small numbers, this species occupies either minute crater-nests or nests beneath fallen timber and loose rocks. The populous colonies often contain several queens each. Winged forms appear in the nests from the middle of June to late August.

7. *Monomorium pharaonis* L.

One colony of this species was found under a house near Twin Falls. This locality is decidedly out of its normal range.

8. *Solenopsis molesta* Say

This ant is occasionally found beneath rocks in moist habitats throughout southern Idaho, and is usually observed in the superficial nest chambers of other ants (*Formica fusca subsericea* and *F. fusca neorufibarbis* Emery).

9. *S. molesta validiuscula* Emery

Much more abundant than the typical species, colonies of this variety are widely scattered throughout the region under discussion, but make their appearance only in moist areas. The nests are similar to those of the typical *molesta* but are more isolated and of smaller size.

10. *Manica mutica* Emery

One colony of this ant was observed beneath a large rock along a stream, thirty-five miles south of Twin Falls. It was quite small and the occupants, all workers, were sluggish and unoffensive.

11. *Myrmica brevinodis* Emery

Three nests of this species, which is rather abundant in the Middle West, were beneath rocks in a very moist *Agropyron repens* area near Twin Falls.

12. *M. brevinodis sulcinodoides* Emery

Several colonies of this variety were beneath rocks in *Hordeum jubatum* areas along streams at Twin Falls. The workers were abundant and very sluggish. Winged forms appeared in the nests during early July.

13. *Aphaenogaster uinta* Wheeler

Six large colonies of *uinta* nested beneath rocks in the moist Snake River Canyon, near Twin Falls. Only the workers were found, all of whch were very timid.

14. *A. subterranea occidentalis* Emery

This variety is rather commonly distributed in moist areas, where it builds small nests beneath rocks. Winged forms apear in July and August, depending upon the locality.

15. *Stenamma brevicorne* var.

This undetermined variety of *brevicorne* is of lesser importance in the Twin Falls area, where it occupies very minute nests near streams or in other moist habitats.

16. *Crematogaster lineolata* var. (near *cerasi* Fitch)

Large colonies of this ant abounded beneath flat rocks throughout the semidesert area, being more numerous, however, in rather moist places. Each colony contained many queens. Winged forms appeared in late June near Twin Falls.

17. *Dorymyrmex pyramicus* Roger

Nests of this species were found in limited numbers near

Twin Falls, occupying small, flat crater-nests of fine sand, in open areas of the sagebrush semidesert, and occasionally on the faces and in the denuded areas of mounds of *Pogonomyrmex occidentalis* Cresson.

18. *Tapinoma sessile* Say

Large colonies of this very common and well known ant are beneath rocks in moist places. Winged sexes appear in late June at Twin Falls.

19. *Iridomyrmex pruinosus* var.

Populous colonies of very active workers of an undescribed variety of *pruinosus* were found near Hagerman, inhabiting aggregated crater nests of fine sand in an area of greasewood.

20. *Lasius niger americanus* Emery

This very common occupant of the more moist areas throughout the state, nests beneath fallen timber or rocks, and more rarely occupies small, rude crater-nests of earth or sand. The workers are abundant and much brood develops into winged forms throughout June, July and August, depending upon the location of the nests. The ants are secretivorous and in some cases also scavengeristic.

21. *L. niger sitkaënsis* Pergande

Although less common than the variety, *americanus*, *sitkaënsis* is, nevertheless, a rather frequent occupant of moist places. Its nests and habitats are almost identical with those of *americanus*.

22. *L. umbratus mixtus aphidicola* Walsh

This variety lives beneath stones in very moist areas throughout the Snake River Plains. Its food consists chiefly of secretions from aphids and coccids which are attended in the nests.

23. *Polyergus rufescens breviceps* Emery

Only one nest of this species, which contained many workers of *Formica fusca subsericea*[1], was observed by the writer.

[1]Slave complex.

It was beneath a large flat rock on a dry sagebrush-covered hillslope in the Snake River Canyon, near Twin Falls.

24. *Myrmecocystus melliger semirufus* var.

Numerous crater nests, about six inches in diameter, predominated in a semidesert sand dune area near Indian Cove, and have also been found on sand hills near Buhl. The populous colonies contained both males and females in early June at Indian Cove. Repletes were not present.

25. *M. yuma* Whlr.

Many small crater nests of fine sand were found on a sagebrush plain near Hammett. The workers were very active. Winged forms appear in the nests during early July. Repletes were not found.

26. *M. mexicanus* var.

Sandy crater nests of an undescribed variety of *mexicanus* abounded in a sandy area near Indian Cove. Other localities include Hollister and Twin Falls. Males and females appeared in the nests in early June near Indian Cove and in late June near Twin Falls. True repletes were not present in the nests.

27. *Camponotus maculatus vicinus nitidiventris* Emery

This variety abounds beneath rocks in the more moist places of the sagebrush plains and in wooded areas of aspen and western yellow pine at higher elevations. The colonies are large and the workers active. Males and females appear in the nests throughout June and July near Twin Falls. I have taken this ant as far north as Boise.

28. *C. hyatti* Emery

A very few colonies of this species were beneath rocks on rather moist sagebrush and bromegrass-covered hillslopes near Twin Falls.

29. *C. modoc* Whlr.

This species is abundant in pine and aspen groves south of Rogerson. It inhabits nests in moist, rotting logs.

30. *Formica rufa obscuripes* Forel

This ant is a very common occupant of the Snake River Plains, where, as populous colonies, it inhabits large thatched mounds, usually surrounding plants of sagebrush. It has been taken by the writer as far north as Stanley, where it is replaced by the variety *melanotica* Emery. Winged sexes appear during late June near Twin Falls.

31. *F. subpolita* Mayr.

Common to the semidesert plains and occurring throughout the state, this species is found inhabiting nests beneath rocks, and less commonly small crater mounds. Winged forms appear in early July at Twin Falls. Coccids and pseudoscorpions have been removed from nest chambers.

32. *F. subpolita camponoticeps* Whlr.

This variety is of less common occurrence than is the typical species but, nevertheless, very often nests beneath rocks under similar conditions and in the same localities as the typical *subpolita.* Workers were infested with the fungus *Laboulbenia formicarum* Thaxter.

33. *F. fusca neorufibarbis* Emery

F. neorufibarbis lives beneath rocks or in earthen mounds in rather moist, shady and grassy areas throughout the Snake River plains. It feeds chiefly on honeydew and dead insects.

34. *F. fusca subsericea* Say

This very common ant is found in practically all parts of the region where it inhabits nests beneath rocks or occupies large earthen mounds.

35. *F. fusca subaenescens* Emery

F. subænescens is more rare than is *subsericea* and occupies more moist habitats. Where found, the nests are beneath large rocks. The an thas been collected near Twin Falls and Stanley.

36. *F. neogagates* Emery

A few nests of this species have been found by the writer

in a deep canyon near Twin Falls. These were rather small and were beneath rocks on moist hillslopes covered with bunchgrass (*Agropyron* sp.).

37. *F. sanguinea subnuda* Emery

Nests of *subnuda* were found, although rather infrequently, from the southern border of the state northward to Boise. The small colonies, in which abounded workers of *F. fusca subsericea* as slaves, were beneath large rocks in moist sagebrush areas.

38. *F. sanguinea puberula* Emery

Several small colonies of this ant were observed near Nampa, on the sagebrush plains. Many of the adults were infected with the fungus, *Laboulbenia formicarum* Thaxter.

39. *F. oreas comptula* Wheeler

Three nests of this rather uncommon ant were found by the writer near Rogerson, beneath large flat rocks on a sagebrush-covered hillslope. Winged forms appeared in early July. Each of the nests contained two or three beautiful golden-yellow queens.

40. *F. lasioides vetula* Whlr.

Several colonies of this ant were found at the upper limits of the Snake River Plains. The ants live beneath rocks in moist areas of abundant vegetation.

A SPECIES OF EPISTENIA (HYMENOPTERA, CHALCIDOIDEA) FROM COLORADO

By T. D. A. Cockerell
University of Colorado, Boulder, Colo.

On April 5, 1934, Mr. Charles H. Hicks bred a very beautiful Chalcidoid from the nest of an Odynerid wasp, found a short distance above the mouth of Boulder Canyon, Boulder County, Colorado. Trying to determine its affinities, I thought it might be referable to the genus *Ormyrodes* of Brues, said to be recognisable by "the extremely long, awl-shaped abdomen, uniformly punctuate body, hairy eyes, and long postmarginal vein in wings." The hind coxæ, also are considerably enlarged. However, there were discordant characters: the shorter abdomen, not at all constricted at end of third segment, and first tergite smooth, as well as the well developed parapsidal grooves. The specimen was transmitted to the Museum of Comparative Zoology, and Professor C. T. Brues kindly examined it and at once referred it to the genus *Epistenia* of Westwood, of the Cleonymidæ. This is a widespread genus of rather numerous species, but apparently they are nowhere common, as I do not remember ever having captured a specimen. The resemblance to the Ormyridæ is presumably entirely superficial. Up to the present time 24 species of *Epistenia* have been described, distributed as follows: Georgia (1), California (1), Guatemala (1), Panama (2), Brazil (5), Paraguay (4), Peru (1), Chile (2), South Africa (1), Philippines (1), Borneo (2), Queensland (3). The Colorado species has the following characters:

Epistenia regalis sp. n.

Female: Length about 8 mm.; anterior wing nearly 5; elongate, coarsely punctured, head, thorax, abdomen and coxæ rich purple, legs otherwise clear red, with very fine pruinose white pubescence; antennæ long, with a stout black

flagellum, pointed at apex, its basal joint blue; the long scape, shining greenish blue on outer side, is inserted very little above the mouth; head and thorax dull, with very dense coarse punctures, making a cancellate surface; profile of thorax above practically straight; prothorax very large, swollen, parapsidal grooves very distinct, the mesonotum accordingly trilobed; a black curved keel bounding axillary region anteriorly; scutellum very large and convex, with no groove, the apex nipple-like; base of metathorax shining; tegulæ small and black; wings hyaline with black veins; marginal vein less than half length of submarginal; stigmal long and distinct, thickened at end; postmarginal at least as long as marginal; front femora robust, with a tooth beneath toward end; hind femora moderately stout; the large hind coxæ rough with fine dense punctures, running in rows; abdomen nearly 5 mm. long, long-fusiform; the short first tergite smooth, shining green and rosy; second to fourth deep purple, with black hind margins, the surface covered with very large round punctures, not in rows, the dorsum not keeled; apical part of abdomen black and keeled, the ovipositor little exserted. The eyes have very long hairs.

Type in Museum of Comparative Zoology, Cambridge, Mass.

It may be that all the species of *Epistenia* are parasitic on Eumenidæ. *E. odyneri* Ashmead (Psyche, VII, 1896, p. 336) was bred by Dr. A. Davidson in California from *Odynerus rufobasilaris* Ashmead. It is quite a different species, the female 6 mm. long, strongly green, flagellum rufopiceous beneath, knees honey-yellow, tibiæ and tarsi dark fuscous.

SOME ANTS FROM THE BAHAMA ISLANDS

By William Morton Wheeler
Biological Laboratories, Harvard University

Our knowledge of insect distribution in the Bahamas is very meager, limited as it is to a very few of the nearly seven hundred islands and cays composing the archipelago. Of the ants, a group of greater importance in zoögeographical discussion than many other families or even orders less intimately dependent on the soil, I have records from only three of the islands. The account of these insects which I published nearly 30 years ago[1] was based on material which I collected on New Providence and Andros. Mann, 1920, in addition to recording and describing several new forms from the same localities, cited seven species collected by Bluff on Eleuthera Island[2]. I was glad, therefore, to receive from Dr. David Fairchild and Mr. James Greenway a collection of ants which they made on New Providence Island and on some thirteen of the other islands while they were collecting plants, birds and mammals on two expeditions, during 1932 and 1933, of Mr. Allison Armour's yacht, the "Utowana." Both gentlemen accompanied the first expedition, but owing to Dr. Fairchild's illness, Mr. Greenway alone collected ants on the second. The collection comprises 22 forms, and though there are no new forms it furnishes two new records (*Iridomyrmex pruinosus* and *Camponotus planatus*) for the archipelago.

Ponerinæ

Odontomachus hæmatoda insularis Guérin var. *pallens* Wheeler-Wemyss Bight and Bannermantown, S. Eleuthera I. ☿ (Greenway).

[1]Wheeler, W. M. The Ants of the Bahamas, with a List of the Known West Indian Species. Bull. Amer. Mus. Nat. Hist. 21, 1905, pp. 79-135, 1 pl., 12 figs.

[2]Mann, W. M. Additions to the Ant Fauna of the West Indies and Central America. Bull. Amer. Mus. Nat. Hist. 42, 1920, pp. 403-439, 10 figs.

Pseudomyrminæ

Pseudomyrma flavidula F. Smith—One worker from Watlings I. (Greenway).

Pseudomyrma elongata Mayr—One worker from Conception I. (Greenway).

Myrmicinæ

Pheidole megacephala Fabr.—Grand Bahama I. ♂ ☿ ♀ and Watlings I. ♂ ☿ (Greenway).

Pheidole fallax jelskii Mayr var. *antillensis* Forel—New Providence I. ♂ ☿ and Watlings I. ☿ (Greenway).

Pheidole flavens Roger—Bannermantown, S. Eleuthera I. (Greenway).

Crematogaster (*Orthocrema*) *steinheili* Forel—Bannermantown, S. Eleuthera I. ☿ (Greenway); Mayaguana I. ☿ ♀, nesting in pods of mahogany (Fairchild).

Crematogaster (*Acrocoelia*) *lucayana* Wheeler—Grand Bahama I. ☿ (Greenway).

This form is probably only a variety of *C. sanguinea* Roger of Cuba.

Monomorium carbonarium ebeninum Forel—Watlings I. ☿ ♀, New Providence I. ☿ and Bannermantown, S. Eleuthera I. ☿ ♀ (Greenway).

Solenopsis geminata Fabr.—Great Inagua I. ☿, Watlings I. ☿, New Providence I. ☿, Crooked I. ☿ and Clarence Harbor, Long I. ☿ (Greenway); Conception I. ☿ (Fairchild and Greenway). The typical black West Indian form of the species.

Cyphomyrmex rimosus minutus Mayr—Crooked I. ☿ (Greenway).

Dolichoderinæ

Iridomyrmex pruinosus Roger—Mayaguana I. ☿ (Greenway). Common in Cuba and Florida but not previously recorded from the Bahamas.

Dorymyrmex pyramicus Roger—Nassau, New Providence I. ☿, Crooked I. ☿ and Cat I. ☿ (Greenway).

These workers are intermediate in color between the typical form of the species and the following variety.

Dorymyrmex pyramicus var. *niger* Pergande—Goat Cays ☿,

Crooked I. ☿, East Plana Cay ☿ and Conception I. ☿ (Fairchild); Watlings I. ☿, Mayaguana I. ☿ and Rum Cay ☿ (Greenway).

Formicinæ

Brachymyrmex heeri Forel—Two workers from Cat I. ☿ (Greenway).

Brachymyrmex heeri var. *obscurior* Forel—Rum Cay ☿ ♀ ♂ (Fairchild and Greenway); New Providence I. ☿, Watlings I. ☿, Great Inagua I. ☿ and Crooked I. ☿ (Greenway).

Camponotus (*Tanæmyrmex*) *conspicuus æqualis* Roger—Nassau, New Providence I. ☿ (Greenway).

Camponotus (*Tanæmyrmex*) *fumidus lucayanus* Wheeler—Nassau, New Providence I. ☿ and Bannermantown, S. Eleuthera I. ☿ (Greenway).

Camponotus (*Tanæmyrmex*) *ramulorum* Wheeler var. *marcidus* Wheeler—East Plana Cay ☿, living in dead stems of Cocothrinax (Greenway).

Camponotus (*Colobopsis*) *triton* Wheeler—I have recently described this species (Bull. Mus. Comp. Zool. 77, 1934) from a single female specimen taken by Dr. W. M. Mann at Fresh Creek, Andros I.

Camponotus (*Myrmobrachys*) *planatus* Roger—A single small worker from Grand Bahama I. (Greenway).

Not previously recorded from the Bahamas though common in Cuba and Southern Florida.

Paratrechina longicornis Latr.—New Providence I. ☿, Great Inagua I. ☿, Abaco I. ☿, Rum Cay ☿, Crooked I. ☿ ♀, Watlings I. ♀ ♀ and Bannermantown, S. Eleuthera ☿ (Greenway).

Nylanderia steinheili Forel—Cat. I. ☿ ♀ (Fairchild).

SOME NEW LONGICORN BEETLES FROM BRITISH HONDURAS

By E. Gorton Linsley
Oakland, California

The new species described below were noted among some miscellaneous Cerambycidæ from British Honduras, very kindly sent to me for study by Mr. Lionel Lacey of New Rochelle, New York.

Protaneflus Linsley, new genus

Elongate, parallel, subcylindrical. Head concave between the antennæ; maxillary palpi longer than labial, last segment slightly triangular; eyes very convex, coarsely granulated; antennæ longer than the body (♂), twelve-segmented; scape stout, subcylindrical, segments six to twelve flattened, serrate, carinate, segments three to seven spinose at apex. Prothorax cylindrical, slightly longer than broad. Elytra scarcely more than three times as long as broad; apices bispinose. Prosternum narrow between the coxæ; mesosternum rather broad. Anterior coxal cavities feebly angulated externally; intermediate coxal cavities closed behind. Metasternal epsterna very narrow, slightly wider at base and apex. Legs long, slender; tibiæ feebly carinate on outer side.

Genotype: *Protaneflus pubescens* n. sp.

A genus related to *Aneflus* and *Axestinus*, but differing from these in the densely pubescent body and very narrow metathoracic episterna. From the former it may be further distinguished by the twelve-segmented antennæ (♂), and from the latter by the spinose antennal segments.

Protaneflus pubescens Linsley, new species

Piceous, very densely clothed with short, white, recumbent pubescence. Head rather coarsely, closely punctured; antennæ densely clothed with short, white pubescence,

sparsely ciliate at apex of segments. Prothorax transversely rugose, coarsely, densely punctured, densely pubescent. Scutellum white. Elytra coarsely and moderately closely punctured, clothed with recumbent, white pubescence intermixed with scattered, suberect hairs. Legs and ventral surface densely clothed with white pubescence. Length 31 mm; breadth 6.5 mm.

Holotype male, a unique taken at Punta Gorda, British Honduras, in June 1932, by Mr. J. J. White.

This fine species is rather suggestive of *Aneflus cylindricollis* Bates, but may be easily distinguished by the dense, white pubescence, twelve-segmented antennæ (♂), and narrow metathoracic episterna.

Stizocera laceyi Linsley, new species

Elongate, subparallel, rufo-testaceous, shining, sparsely clothed with erect pale hairs. Head with scattered coarse punctures; antennæ attaining the middle of the elytra (♀), carinate, segments three to seven spinose at apex; punctation irregular; pubescence short, sparse, intermixed with flying hairs along inner side and at apex of segments. Prothorax slightly longer than broad, coarsely but not closely punctured, clothed with scattered, erect, pale hairs. Scutellum densely pubescent. Elytra nearly four times as long as broad, yellowish-testaceous; punctation moderately coarse, not dense; pubescence pale, sparse, suberect; apex piceous, bispinose. Legs slender, clothed with long, suberect, yellowish hairs; femora bispinose at apex, the spines piceous. Ventral surface shining, sparsely, finely punctured, sparsely clothed with suberect, yellowish pubescence. Length 22 mm; breadth 5 mm.

Holotype female, captured at Punta Gorda, British Honduras, June 1932, by Mr. J. J. White.

A moderately large, shining, rufo-testaceous species with yellowish-testaceous elytra which become piceous at the apex. It is related to *S. armata* Serv. from Brazil, but in addition to differences in color, may be easily distinguished from that species by the short antennæ, which in the female attain only the middle of the elytra (in *S. armata* ♀ the antennæ are slightly longer than the body), and by the bispi-

nose intermediate and posterior femora (in *S. armata* only the posterior femora are spinose at apex).

Stizocera aliena Linsley, new species

Elongate, slender, reddish-brown, shining. Head coarsely, closely punctured; antennæ attaining apical one-third of elytra (♂), middle of elytra (♀), carinate, ciliate, segments three to five spinose at apex. Prothorax about one-fourth longer than broad, coarsely, closely punctured, sparsely clothed with erect, pale pubescence. Scutellum densely pubescent. Elytra four times as long as broad; punctation coarse; pubescence short, erect, yellowish; apices emarginate, the outer angle dentiform. Abdomen shining, sparsely pubescent. Legs slender, sparsely clothed with erect, yellowish hairs; femora not spinose. Length 15.5 mm; breadth 2.75 mm.

Holotype female, and allotype male, taken at Punta Gorda, British Honduras, June 1932, by Mr. J. J. White.

This species differs from typical *Stizocera* as characterized by Gounelle [1] in that the femora are unarmed at the apex. In spite of this difference, *S. aliena* agrees more closely with *Stizocera* than with any other described genus. It may be associated in our lists with *S. cribricolle* Bates (from Mexico), from which the elongate, cylindrical prothorax, and slender, unarmed, non-clavate, non-pedunculate femora will easily separate it.

[1] Bull. Soc. Ent. France, 1907, p. 241.

A SPECIMEN OF THE JAMAICAN VERMILEO

By William Morton Wheeler

In a collection of Jamaican Diptera recently received by the Museum of Comparative Zoölogy I find what might be regarded as a topotype of the Rhagionid *Vermileo tibialis* (Walker). This specimen, a male, was taken by Miss Lilly Perkins at Baron Hill, near Jacksontown, Trelawny, and is interesting both because the species has not before been recovered since it was described and figured by Walker, nearly eighty years ago, in his "Diptera Sandersiana" (p. 156, Pl. 4, Fig. 3.) as the type of his genus Pheneus, and because of its very close relationship to a Cuban Vermileo which I described in my "Demons of the Dust" (1930) and in Psyche, Vol. 36, 1931, p. 167. This form I regarded as a distinct variety (*dowi*) of *tibialis* since it differed in certain respects from Walker's description and figure, which were based on a male specimen. Miss Perkins' specimen lacks the hind legs and portions of the antennæ and anterior tarsi, but there are in other portions of the body several peculiarities which show that the Cuban form is, as I inferred, at least varietally and possibly even subspecifically distinct.

The specimen is larger and more robust than the *dowi* males which I reared from larvæ taken by Mr. R. P. Dow in August, 1930, in the Trinidad Mountains of Cuba[1]. Its body and wing measure 12 and 11.5 mm. respectively, whereas the corresponding dimensions of *dowi* are 9.5-10 and 8 mm. In the Jamaican type the face and vertex are decidedly broader, the eyes less convex, the first antennal joint shorter, not more than one and one-half times as long as broad, the humeri more prominent and more acute. The body is more uniformly fulvous, the abdominal segments

[1]More recently, one of my students, Mr. B. B. Leavitt, collected a large number of larvae of this form at much lower elevations not far from the Atkins Laboratory of Harvard University at Soledad, near Cienfuegos, and has studied their structure, transformation and behavior.

not infuscated posteriorly and the first segment bears anterodorsally a deep black, transverse band. The halteres have yellow knobs as in the Cuban variety and the wing-venation is the same, but both the membranes and the veins are more deeply fulvous and the black, transverse band across the middle of the wing is decidedly narrower, with more irregular contour.

Since we know the precise locality in which Miss Perkins took her specimen it should now be easy to find the larvæ, which make their pits like the ant-lions in sand or dust under overhanging rocks or embankments, and to ascertain, by rearing a number of imagines of both sexes, the precise differences between the Jamaican and Cuban forms of this beautiful fly.

NOTES ON *MEGARHYSSA LUNATOR*

By Cyril E. Abbott
Morgan Park, Ill.

For several years I have had the opportunity to observe rather closely the activities of *Megarhyssa lunator,* and have discovered some curious, and apparently hitherto unknown peculiarities of behavior.

Emergence of Adult Insect

In view of the fact that the adult virgin female is found in a burrow opening just beneath the bark, as well as from the fact that this burrow must be enlarged to permit emergence, it seems likely that the larval Megarhyssa pupates near the surface of the tree. The insect is enabled to escape by biting bits of wood from the walls of her prison. In all observed cases the overlaying bark had been removed by the observer. No doubt the insect is capable of gnawing through the bark; at least a virgin female imprisoned in a cloth sack in an effort to attract males chewed her way to freedom.

The emerging female is much disturbed by suitors, which, having gathered in numbers about her burrow, insert their abdomens into the opening. In some cases a male becomes so firmly wedged into this opening, clinging meanwhile with his claws to the bark, that he is removed with difficulty by the observer.

The details concerning emergence of the males have not been observed. The openings from which they leave the tree have an average diameter of 2.27 mm., those of the females 4.30 mm.

After enlarging the opening of the burrow the female insect rests for a few seconds. She then crawls out onto the surface of the tree.

Mating

In spite of the ardor of the male insects (see Riley, 1888)

there is no mad rush for union with the female. Sometimes there is a mild contest between two or three individuals; more often only one male reaches the female. He rests upon the back of her abdomen which he clasps with his legs. He then flexes his abdomen ventrally, forming thereby a flat spiral. In this position the extreme tip of his abdomen, in an inverted position, is directed toward the corresponding free or caudal end of the female abdomen. The penis, the median of the three terminal appendages of the male (the others are claspers) thus enters the genital opening of his mate in a posterior direction; a condition made necessary by the peculiar fact that the female genitalia open anteriorly.

Mating requries only a few seconds: at the end of that time the female dislodges her mate by backward thrusts of her posterior legs.

It does not seem likely that the female Megarhyssa ever again requires the attentions of a mate. Males ignore all but emerging, and hence virgin, females. Moreover, since the female possesses a definite spermatheca, it is probable that she, like other Hymenoptera, carries with her the sperm necessary for the fertilization of eggs.

Oviposition

In spite of the generally accepted conclusion that Megarhyssa deposites her eggs by *drilling* through solid wood, my own observatons contradict this claim. Of literally hundreds of ovipositing females observed, not *one* could be said to drill in the true sense of the word. In cases where this appeared to be true a judicious prying off of the overlaying bark revealed that the ovipositor had penetrated a crack in this same bark and entered the end of an open burrow. Where bark had already been stripped from the tree, individuals were often seen inserting the ovipositor directly into an open burrow.

It is of course possible that the female Megrahyssa may drill through the bark to a burrow. It is also possible that individuals may take advantage of openings made by an ovipositing Tremex. As long ago as 1794 Marsham observed this kind of behavior on the part of *Ichneumon manifestor*.

We may conclude from this that Megarhyssa is not as well equipped with wonderfully mysterious instincts for prey as some students would have us believe. In fact I once found this insect ovipositing in the burrow of a Buprestid!

Trees Attacked

Naturally Megarhyssa lives in trees most abundantly supplied with specimens of Tremex. In this region these seem to be almost exclusively soft maples (Acer saccharinum). The only other trees troubled to any extent are elms. The maples, probably because of the softness of the wood, are especially susceptible to insect attacks.

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POMPILID WASPS AND PREY-TRANSPORTATION BY WATER

By Phil Rau
Kirkwood, Mo.

One of the most interesting items of wasp behavior is reported by Needham and Lloyd[1] on the use of water as a medium for the easy transportation of spider prey by *Priocnemis flavicornis.* This Pompiled wasp was occasionally seen on Fall Creek, New York, where it combines flying and water transportation.

"Beavers swim with boughs for their dam, and water-striders run across the surface carrying their booty, but there is a wasp that flies above the surface towing a load too heavy to be carried. The freight is the body of a huge black spider several times as large as the wasp. It is captured by the wasp in a waterside hunting expedition, paralized by a sting adroitly placed, and is to be used for provisioning the nest. It could scarcely be dragged across the ground, that is with the dense vegetation of the waterside; but the placid stream is an open highway. Out into the surface the wasp drags the huge limp, black carcass of the spider, and, mounting into the air with her engines going and her wings steadily buzzing, she sails away across the water, trailing the spider, and leaving a wake that is a miniature of a passing steamer. She sails a direct and unerring course to the vicinity of her burrow in the bank, and brings her cargo ashore at some nearby landing. She hauls it upon the bank and then runs to her hole to see that all is ready. Then she drags the spider up to the bank and into her burrow, having so saved much time and energy by making use of an open waterway."

It would seem from the records that this highly intelligent behavior is an isolated case; therefore the purpose of this note is to record three similar instances of this singular behavor. It is however to be regretted that in all three cases was it impossible to get either Pompilid or spider for identification.

[1]Life on Inland Waters, page 331, 1916.

In 1915 on the water near the shore of a lake at Lakeview, Kansas, a Pompiled and her spider were seen behaving in the same way as described above but at that time I was a novice in waspology and did not fully appreciate the drama that was being enacted before me. I thought at the time that both had fallen from the branches overhead, and the wasp was trying to regain the shore. In 1919 at Wickes, Missouri, my wife saw the same behavior on the surface of a small pond, but not having a net was unable to capture the pair; but knowing of Needham and Lloyd's account by this time she was fully prepared to appreciate the behavior.

And the third observation was made by Dr. Gustave Dahms, an ardent fisherman, who pays much attention to nature study. Here is his account as he related it to me:

On July 20th, 1932, while watching his cork bob in the stream near Creve Couer Lake, Mo., he saw a black wasp towing a spider twice as large as herself on the surface of the water. Straddling her spider, she looked like an aquaplane, while she made a distance of six feet to the wooden pillar in the water supporting a railroad trestle. Landing on this pillar, she moved upwards and backwards dragging her spider after her to the top of the trestle, and then disappeared. There was soil packed in between the railroad ties at the edges, and in this she evidently buried her spider. Most interesting of all was the fact that between 10:30 and 2:00 o'clock while this fisherman was watching his bob, this behavior was repeated four times with hardly any variation in her course, in relation to this bob. The trip, as he enthusiastically explained, was purposeful each time, and the distance of ten feet of travel in the water from the bob where he always first noticed the wasp to the post on which she clmibed consumed only about one minute, so fast did she sail. There was a slight current in her direction which helped her to make speed. Unfortunately he paid no attention from whence she came, but saw her each time as she neared the bob. Unfortunately too he did not get the specimen for identification and he never found out whether all four spiders went into one burrow or into four burrows.

A NOTE ON THE ATTACHMENT OF THE WASP, *BEMBIX NUBILIPPENNIS*, TO THEIR NESTING SITES

By Phil Rau
Kirkwood, Mo.

In "Wasp Studies Afield" in 1917 I describe the nesting behavior of *Bembix nubilipennis*. The wasps have emerged year after year in early summer, and then have dug their new tunnels in the same site where they were born, in this instance the hard-baked barren soil of a baseball diamond. This gave me at that time an opportunity to study four successive generations of these wasps in as many years.

Dr. Wm. M. Wheeler in his introduction to the above work especially calls attention to the strong attachment of these wasps to their nesting site, for they keep to the same locality for generation after generation. "Such a habit," says Dr. Wheeler, "has the ear-marks of great antiquity, and seems to indicate that the present type of nesting site is like the one in which the group originated." This statement has caused me often to visit this site over a period of years, to see how long they would maintain this colony. The colony was first observed in a vacant lot in the heart of southwest St. Louis in 1914 (*loco citato* pp. 1-36) and today, twenty years later, the colony is nesting in the same way in the same site. They have not spread to the surrounding grass plots or to a roadway nearby; the population has not diminished with the passing of the years, and neither has the population increased during this period. There is one slight variation, however, in that a portion of the population has wandered away and become colonized in a second and smaller baseball diamond two hundred feet away. This smaller diamond was made ten years ago, and I watched it yearly to note any Bembix migration. I felt the site was suitable for Bembix, and it would be only a matter of time before they would become established. The new barren

area was not adopted until the seventh year of its existence, and now after four years it has only about twenty burrows of this wasp, whereas several hundred may be counted on the older diamond.

Thus we see that not only do Bembix stay on one site generation after generation, but many years are likely to elapse before certain mothers turn their attention to an attractive area just within a stone's throw of their old home. Dr. Wheeler's conclusion is probably correct when he says that the species shows its archaic origin by its nesting habits.

THE STING OF THE MALE WASP, *MONOBIA QUADRIDENS*

By Phil Rau
Kirkwood, Mo.

The females of solitary wasps have a functional sting, while male wasps are devoid of stings, but often the latter are not devoid of the desire to sting. In picking up males of *Sceliphron cæmentarium* and *Chalybion cæruleum*, one occasionally notes attempts to pierce one's flesh with the tip of the abdomen. Stinging by the males in these two species is not possible, but it may prove useful in frightening an enemy.

In *Monobia quadridens* the female can sting one's hand and cause a slight pain, but I was indeed surprised when I picked up a male to find him also able to inflict pain by piercing the flesh with the tip of his abdomen. The pain resembles that of a sharp needle prick and is over after a few seconds, since of course no poison is injected. The attempt at stinging by the male fulfills a purpose similar to the sting by the female because it effects the release and escape of the insect; the same behavior in its natural habitat, when trapped by an enemy, would prove beneficial to the male.

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PRELIMINARY NOTE ON THE STRUCTURE OF THE PRETARSUS AND ITS POSSIBLE PHYLOGENETIC SIGNIFICANCE

By Richard T. Holway

Biological Laboratories, Harvard University

The uncertain reliability of morphological structures for determining ancestral relations is well known and the extreme care and attention to the vagaries of parallelism, specialization, etc. so necessary for the development of valid theories have been rightly emphasized of recent years. However, in spite of its late disrepute, there is yet much to be learned from comparative morphology if sufficiently long series are studied and checked with the trends of parallel structures and if a most judicious interpretation of the evidence is demanded.

The primary purpose of this paper is to indicate the type of claw-segment found in the important insectan orders together with the common basic plan occurring throughout and also to outline possible homologies which further study and examination of selected and thoroughly representative series from each order may support. Although it is impossible at the present stage to offer any evidence substantial enough to warrant forming exact conclusions as to homologies from order to order, to say nothing of attempting to solve phylogenetic problems, there are without doubt most significant agreements in many cases which provide definite possibilities to be tested by further study. Especially important are those correlations which fall in with phylogenetic concepts already accepted (or debated) from the evidence of the comparative morphology of other structures.

For example, the concurrence of Trichoptera and Lepidoptera is not questioned and some investigators have suggested that these two groups might even be conceived of as one valid order. The nature of the claw-segment of Astenophylax (Fig. 21) and Automeris (Fig. 22) shows at a glance the proximity of these structures even in such advanced representatives of the respective orders.

The relative value of a structure like the pretarsus as a phylogenetic guide may be uncertain, but the above example indicates that such consistency of the claw-segment from order to order should make it of considerable utility in checking theoretical relationships. Although the basic plan of the pretarsus presents a certain conformity throughout the orders, there are sclerites which are variable enough to warrant their investigation from the standpoint of taxonomy. For example, within the Hymenoptera the orbicula may be important in this respect. Hayes and Kearns (1934) have studied the empodium of Coleoptera and find that the Adephaga is the only group showing any consistancy in structure; they conclude, in general, that there is in some a tendency towards generic or family uniformity but that the super-families are decidedly heterogeneous. Arolia and pseudarolia have long been used as the basis of classification for the Miridae and for other Hemiptera the empodium may prove to be of taxonomic value.

Acknowledgements

The writer is indebted to Professor C. T. Brues and Professor G. C. Crampton for their advice during the preparation of this paper, and to them and to the Museum of Comparative Zoology for much of the material herein figured.

Terminology.

The general structure of the pretarsus has been figured many times for different orders: Snodgrass gives detailed descriptions of the condition in the honey-bee (1925) and figures several other types (1927); Crampton (1923) compares the claw-segment of Periplaneta with those of Leptid and Asilid Diptera; Hayes and Kearns (1934) have studied the pretarsus of Coleoptera and summarize past work on

this structure; de Meijere's investigations are more extensive and cover all the important orders but his German terminology is not used at all in this country. A complete history of the terminology of the numerous parts of the claw-segment must be left for a later and more comprehensive study of this structure, therefore that system accepted by the more recent investigators is followed throughout. In some cases the same terms are used from order to order, even though true homology is not yet proved, instead of offering new names which in all probability would have to be discarded after further study supplied evidence to substantiate suspected homologies. However, all doubtful cases are indicated as such.

The following is a list of the terms herein used with their definitions and equivalents.

Apodeme (Unguitractor tendon, Sehne).—This is the tendon which runs from the unguitractor plate to the tibial musculature, the flexor of the claws. Supposedly the claws spring back into their normal position by natural resiliency when tension through the apodeme is released as there is no levator of the pretarsus in insects. (Crampton 1923) (Snodgrass 1929).

Arolium. In general the term arolium is restricted to a median paired or unpaired, pad-like structure which is articulated to the unguifer or arises from a position midway between the claws. Whether the complicated median structure of Hymenoptera, Lepidoptera and Trichoptera, the paired ribbon-like parts known as arolia in certain Hemiptera (Miridae), and the single median pad of Diptera and orthopteroid insects are all strictly homologous is problematical. However, the term arolium is here used to designate these structures in every order in which they occur, according to the definition above.

Basipulvilli. (auxilliæ). This term was first applied by Crampton (1923) to the small lateral sclerites at the bases of the pulvilli of Diptera and also to similar sclerites laterad of the unguitractor in Periplaneta although true pulvilli are not found in Orthopteroids. The auxilliæ (Hymenoptera), of MacGillivray, are evidently homologous with

these structures but wherever such parts are found they are called basipulvilli in this paper.

Camera. (Bugel, or bow of Arnhart). Camera was originally applied to the curved narrow sclerite supporting the paired lobes of the arolium in Hymenoptera (MacGillivray). It is herein also used to designate the evident homologue in Trichoptera, Lepidoptera and Mecoptera.

Distitarsus. (onychium, digitus, ungula, etc.). The distal tarsal segment.

Empodium. (onychium). This term has been used for a variety of structures. Crampton (1923) finds that it should be restricted to a process of the unguitractor as found in Asilid Diptera and other orders. Hayes and Kearns (1934) accept this view and apply the term in their work on Coleoptera. Empodium is often used erroneously to refer to a pulvillus.

Flexor membranes. These are the membranous areas beneath the claws which apparently serve to transfer the tension of the apodeme on the unguitractor to the claws thus forcing them downwards. They are the areas from which, it has been suggested, the puvilli may have developed.

Gleitrinne or Gleitfläche (de Meijere). A prolongation of the ventral wall of the distitarsus. It is especially developed in Odonata and in some Coleoptera where it extends forward between the claws.

Onychium. This term has been used in such a variety of ways that it appears impossible to define it satisfactorily and therefore is not used in this paper.

Orbicula. In Hymenoptera, a small dorsal sclerite at the base of the arolium and distad of the unguifer. The orbicula is quite variable as to size and shape in this order and may be of taxonomic value.

Parempodia. (paronychia). Bristle-like appendages of the empodium. (Coleoptera and Hemiptera).

Planta. As used by Snodgrass, Crampton and MacGillivray planta applies only to the sole of the foot (typically in Hymenoptera and Orthoptera). However, the examples

of most of the various orders observed show a plate which is probably homologous with the hymenopterous planta and therefore this term is used wherever practicable. Coleoptera, Diptera, Hemiptera, Dermaptera, Odonata and Ephemeroptera do not exhibit the planta in its typical condition although an empodium is present in these orders (except Ephemeroptera) which suggests the possibility that the empodium is merely a modified planta, closely associated with the unguitractor. Further study is needed to determine the correct relationships of these structures.

Snodgrass (1929) suggests that the planta may possibly be a subdivision of the unguitractor. However, the nature of the planta under high magnification is unlike that of the unguitractor which always gives a granulose appearance, is heavily sclerotized, and is sharply demarked in every case observed even to the primitive Odonata and Ephemeroptera. On the other hand the planta is variable in extent and degree of sclerotization and never shows the heavy, rugose aspect of the unguitractor. It seems more likely that the planta represents merely an area of the membranes distad of the unguitractor which has become sclerotized in greater or less degree according to the stress to which it is subjected by the tension of the apodeme and unguitractor. Of course the unguitractor itself is a sclerotized area of the membrane but it is always distinct in outline and not an indefinite structure as the planta often appears to be. (Note.—Planta has also been used to refer to the basal joint of the post tarsus in pollen-gathering Hymenoptera, to the soles of the post tarsal joints and to the anal clasping legs of caterpillars).

Pseudarolia.—Paired structure which occurs beneath the claws of some Hemiptera (Miridae) and which possibly will prove to bear some relation to pulvilli.

Pulvillus.—Originally referred to the pad-like structure beneath each claw in many Diptera. Other orders in which undoubted homologous parts occur are Lepidoptera and Trichoptera. Membranous areas are found beneath the claws in most orders but it is impossible to consider them as homologous with the pulvilli. In this paper they are

termed flexor membranes. Crampton (1923) suggests two possible derivations for the pulvilli: either they arose as portions of a divided arolium (see condition in Hymenoptera, Fig. 26, Plecoptera, Fig. 7, and Mantispa, Fig. 19.) or they are detached membranous areas from the under side of the claws (see condition in some Ephemeroptera, Fig. 2, Homoptera and Hemiptera, Figs. 14 and 15, and the relation of basipulvilli to such membranous areas in Blattids.)

Ungues.—The claws.

Unguifer.—(tubercula, and Gelenkhöcker of de Meijere) refers to a small dorsal sclerite by which the claws are articulated with the distitarsus.

Unguitractor—(tarsulus, calcanea). This sclerite is the most constant structure of the pretarsus and is easily identified in all insects thus far observed because its general appearance is always the same though varying in size and shape. The surface of the unguitractor is sculptured to a greater or less degree with nodules which are sometimes almost spinelike. These nodules appear to correspond with the polygonal cells of the hypodermis and these cells may be seen through the chitin with high magnification. Snodgrass (1927) shows that in Tibicen this plate may be divided into two sclerites and also he figures in the membrane distal to the unguitractor, two small plates which he says may represent the arolium. It seems more likely that they are a divided planta but there is little evidence as yet for either supposition.

Discussion.

Order Odonata

Anax junius Drury. (Fig. 1)

The claw-segment of *Anax* is simple and consists of the unguitractor plate (ut) with the expanded distal portion which is probably an empodium (em?) and of the lateral fleshy pads, flexor membranes (fm.),—which transmit tension to the ventral surfaces of the claws. The Gleitfläche of de Meijere, or thickened ventral portion of the

distitarsus over which the unguitractor slides, is well developed in Odonata and a process of this structure extends beyond the bases of the ungues (un). The only other orders in which this condition has been observed are Coleoptera and Hemiptera.

Order Ephemeroptera

Siphlonurus sp. (Fig. 2)

The unguitractor is a small pear-shaped plate and the claws (un) are simple. The important feature in this case is the membranous pad-like structure (pv?) closely applied to the ventral surface of each of the ungues. It is this condition which has led Crampton to suggest that possibly the pulvilli (Diptera) were derived from some such situation, that is, a splitting off of a ventral membrane from the claw itself. Proximally these pad-like structures are closely associated with the membranous areas transmitting tension from the unguitractor to the claws and in fact give evidence of being continuous with them.

Although these examples of Odonata and Ephemeroptera both show their elementary position, (absence of arolium, planta, basipulvilli or other significant structures), they give no evidence of any close relationship for the presence of an empodium in Anax indicates a certain amount of specialization. Thus, if these cases prove to be typical, the conclusions to be derived from the comparative morphology of the pretarsus will evidently be in agreement with the general conception of the relative positions of these orders.

Cursorial Orthoptera

Blattidae—Periplanta americana L. (Fig. 3)

The arolium (ar) is large in this family, although its structure is simple compared with the complicated types found in the higher orders. Ventrally it is membraneous and concave, so that it forms a most efficient adhering organ. The unguitractor is typically large and heavily sclerotized. Two other structures of importance appear in this group. The planta (pl) is a median quadrate plate just distal to the unguitractor and seems to be lightly sclerotized; it bears a single large seta. On either side of the planta is a

small sclerite, the basipulvillus (bp) of Crampton, from which the retractile membrane leads to the under side of the claw. The relation of these membranes to the basipulvilli (where they are present) is the same throughout the orders and with further study should present interesting evidence with respect to the hypothesis that the pulvilli are evolved from such membranes.

Mantidae—Tenodera sinensis Saussure. (Fig. 4)

An arolium has not been found in Mantids thus far observed and such a structure is probably absent in this family. The general plan follows closely that of the roach although a seta is not present on the planta. The flexor membranes are large and especially noteworthy are their lateral expansions which if further produced might easily take on the appearance of pulvilli!

Order Isoptera

Termopsis angusticollis Walker (Fig. 5)

Again, in this case the basic plan follows closely that of the Blattid; however, the planta is much smaller than in either Mantid or Blattid and the seta does not arise from the planta itself but from the membrane. This condition might be taken as evidence for the view that the planta is a variable sclerotized area of the membrane between the claws. Although there is no arolium we find between the bases of the claws in winged termites a small plate (ar?) which undoubtedly represents an abortive arolium for in winged specimens of Mastotermes, a definite arolium, even though small and rudimentary, is present. Unguitractor and basipulvilli, as in the Mantid, show no significant variations from the Blattid type.

The proximity of these three groups has been noted many times by students of insect morphology so that such a correlation in type of pretarsus is not surprising. This combination appears even more natural when contrasted with the equally coherent union (from the standpoint of Pretarsus) of the Saltatorial Orthoptera.

Order Embioptera

Oligotoma sp. (Fig 6)

In this order we again find the Blattid type; the planta is more extended laterally and is in contact with the basipulvilli on either side. There is no arolium and the flexor membranes are large and slightly expanded. There seems to be nothing particularly outstanding about the claw-segment of this insect but in general it approaches that of the Plecopteran to such a degree as would not prohibit the conception that these two orders are related.

Order Plecoptera

Pteronarcys dorsata Say (Fig. 7)

Pteronarcys shows the lateral basipulvilli and median planta as found in cursorial Orthoptera and termites. The arolium is a large and complicated structure which is made up of three lobes: a median portion or true arolium, and two lateral smaller pads beneath the claws which may be secondary divisions of the arolium or pulvilli which have become fused with the arolium. A more complete study of the Plecoptera may settle this question if intermediate forms can be found. On the other hand, it is possible that this structure represents a new development with no traceable homologies to the parts referred to above. (This also applies to similar lobes beneath the claws of many Homoptera and Hemiptera, to be discussed later). Dorsally, the membranous pads are supported by chitinous plates (indicated by broken lines) and the median lobe bears two clusters of small setæ on its ventral surface. The presence of planta and basipulvilli make it unlikely that the Plecoptera should be considered with the Archipterygota.

Saltatorial Orthoptera

Locustidae—Melanoplus bivittatus Say (Fig. 8)

A large arolium has been found in all Locustids observed as contrasted to Tettigoniids and Gryllids in which this structure probably does not occur. It should be noted that the presence or absence of an arolium is not a condition which is constant for an order, but further study should

produce information concerning its consistency in groups below ordinal rank. The absence of basipulvilli is characteristic of all the leaping Orthoptera and it is this factor which gives such a clear-cut division between the two orthopteroid groups. The planta of Melanoplus is more heavily sclerotized than the representatives of Tettigoniidae and Gryllidae which were examined.

Tettigoniidae—Ceuthophilus maculatus Say (Fig. 9)

Except for the absence of arolium and basipulvilli, the condition of the planta seems to be the only important feature of Ceuthophilus. This structure is not as heavily sclerotized as it is in Melanoplus and is quite different in shape. Often the planta is so lightly demarked, especially in small insects, that its boundaries are almost indistinguishable from the surrounding membrane.

Gryllidae—Gryllus pennsylvanicus Burm. (Fig. 10)

Gryllus gives us the first radical variation in the unguitractor for here the form is quite different from anything else found among the Orthoptera. This sclerite is characterized by a longitudinal V-shaped ridge or protuberance, the significance of which must remain in doubt until series are studied in groups below the order. It is possible that the less notable variations (chiefly in outline) of the unguitractor observed in these orthopteroid families will prove to be consistent to some degree. The planta may be easily compared with that of Ceuthophilus and differs mainly in the length of the lateral arms and the nature of the posterior margin.

Gryllotalpidae—Gryllotalpa borealis Burm. (Fig. 11)

Considerable modification of the planta is exhibited by Gryllotalpa and its condition in this insect is one of the factors suggesting a close relationship between planta and empodium. Note the numerous large setae and the manner in which the anterior portion of the unguitractor merges with the flexor membranes and planta. Comparison of the latter with the corresponding structure in Ceuthophilus and Gryllus indicates that it is a planta.

Empodium by definition refers to a process of the unguitractor, but this term must also apply to certain structures

closely associated with the unguitractor which are not actual processes of it. Eg., the setiform empodium of Asilid Diptera is articulated with the unguitractor rather than continuous with it; also the coleopterous empodium in many cases gives some evidence that it may be retracted within (or beneath?) the unguitractor as pointed out by Hayes and Kearns. At any rate the empodium is not necessarily a distinct part of the unguitractor, so that the condition in Gryllotalpa may be intermediate between the typical isolated planta (as of Melanoplus) and the empodium of many Coleoptera where there is no discernable break between this structure and the unguitractor. Ceuthophilus and Gryllus may represent a step beyond the Melanoplus type towards closer association of planta with unguitractor.

About all that can be definitely said for the Saltatorial Orthoptera (sensu strictu) at the present time is that they are linked by a universal absence of basipulvilli and by the nature of other more variable features such as planta and flexor membranes. In any case there appears to be a wealth of material to be investigated within this group.

Phasmidae—Anisomorpha buprestoides (Stoll) (Fig. 12)

The absence of basipulvilli would place the Phasmids with Saltatorial rather than Cursorial Orthoptera and this is in agreement with conclusions presented by students of other structures. The unguitractor is narrower than in other Orthopteroids, while the planta is more heavily sclerotized and is triangular in outline, but is distinct from the unguitractor, a condition nearer to that of Locustids than to the other Saltatorial Orthoptera. The arolium is large and is reinforced dorsally by thickened ridges. On the whole the condition of the claw segment of this insect may be considered as supporting the general conception of the position of this family, *i. e.*, related to the Saltatorial Orthoptera but developed along its own line of specialization.

Order Dermaptera

Psalis sp. (Fig. 13)

Apparently basipulvilli and planta are missing in Psalis. If this proves to be true for all Dermaptera, the order will

be set off from the Blattid group on the one hand, and the remainder of the orthopteroid insects on the other. (Speaking from the standpoint of pretarsus only, of course). The unguitractor of Psalis is interesting because of its anterior projection (em?) which could be considered either empodium or planta; superficially, this structure appears to be continuous with the unguitractor and therefore more like a coleopterous empodium except that its margins are vague and it is not heavily sclerotized, *i. e.*, more like a planta. It should be noted and may prove to be significant that all examples of Coleoptera thus far observed show neither basipulvilli nor planta but do have an empodium, whereas all specimens of most higher orders studied are fundamentally of the Blattid type with numerous secondary specializations.

Order Homoptera

Agallia constricta Van Duzee (Fig. 14)

The small unguitractor bears a triangular empodium (em) which in turn is provided with a single heavy seta or parempodium (pem). As there seems to be considerable variation in the number of setae and in the shape of the empodium among the Homoptera, this group must be more fully studied to determine the extent and constancy of such variations. Attached to the under surface of the claws and extending beyond their tips are large membranous pads (pv?) which are reinforced meso-dorsally by small sclerotized areas. There are no basipulvilli.

The pretarsi of Cicadidae are not of this type nor do they show any features characteristic of the more advanced Hemiptera. As figured by Snodgrass (1927) the unguitractor of *T. septendecim* is divided into two plates; there is no empodium, but two small setae-bearing sclerites occur in the membrane between the claws, and Snodgrass suggests that these may represent the arolium but there seems to be more reason to consider them as a divided planta. In *T. cinera* these plates are very faint and difficult to distinguish from the surrounding membrane. There are no pads beneath the claws.

Order Hemiptera

Brochymena arborea (Say) (Fig. 15)

The large triangular unguitractor is extended anteriorly to form a quadrate empodium which bears a parempodium on each of two lateral protuberances. Beneath the claws are pad-like structures (pv?) reinforced by chitinous plates but not attached to the claws beyond their bases in contrast to the condition in Membracidae, Cicadellidae, etc. Although it seems very probable that these pads will prove to be identical with those of the Homoptera, but separated from the claws, it is more questionable whether they can be considered as homologous to the pulvilli of higher orders especially because of the fact that typical basipulvilli do not appear in the Hemiptera-Homoptera. The condition in these groups, however, possibly indicates a way in which sub-ungual pads may be developed and split off from the claws. Further reduction of the membranes might result in the typical pseudarolia of the Mirids! It is hoped that an extensive study of the Hemiptera-Homoptera will illuminate the relations of these various structures.

Order Coleoptera

Phyllophaga fusca Froe. (Fig. 16)

As mentioned above, the empodium, rather than basipulvilli and planta, is the characteristic feature of Coleoptera. In this specimen the unguitractor is narrow and the empodium is expanded distally into a broad plate which bears two parempodia or large setae. Each claw is provided with a large median tooth.

Hayes and Kearns have figured many specimens from this order and although they find the empodium absent in many cases, there seems to be a typical fundamental plan for the coleopterous pretarsus. That is: First, a well developed unguitractor with or without some form of empodium which in turn may or may not bear parempodia; Second, total absence of any membranous structures which could represent arolia, pulvilli, etc. Hayes and Kearns find that "some cleared specimens show what appears to be a basal part of the empodium withdrawn into the body of the

unguitractor." This condition is evidently the same as that here shown in *Phyllophaga fusca,* (Fig. 16) in which the broken lines indicate the basal part referred to. It is questionable whether this is really within the unguitractor; this portion of the empodium might be beneath the unguitractor, or, merely a degree of sclerotization.

There is considerable similarity between the claw-segments of Dermaptera and Coleoptera. Although the empodium of Coleoptera is of course much more varied than that of Dermaptera, these orders agree in the absence of other significant structures. Some of the figures from Hayes and Kearns in which the empodium is absent are strongly reminiscent of the condition in Psalis, as in the latter, the area distad of the unguitractor is rather indefinite so that it is not difficult to imagine the sclerotization of this area to form the kind of empodium characteristic of Coleoptera—or its total lack of sclerotization with a resulting absence of empodium which is also a condition commonly found in Coleoptera. This must remain pure speculation, however, until checked by further study.

Order Neuroptera

Sialidae—Corydalis cornuta L. (Fig. 17)

There is no arolium but the planta is large and the basipulvilli are contiguous with its lateral margins. The claws are simple and the unguitractor is triangular like that of Ithone. In general the pretarsus of Corydalis is surprisingly different from that of Mantispa, but except for the absence of arolium and basipulvilli setae, it is easily comparable to the claw-segment of Ithone.

Ithonidae—Ithone sp. (Fig. 18)

The arolium is a median pad somewhat like that of *P. americana,* but much smaller and without the ventral concavity of the latter. The relations of planta and basipulvilli are of the Blattid type, but the planta is very lightly sclerotized and is continuous with the arolium, so that it might almost be considered as a part of this structure. The basipulvilli occupy the normal position and are provided with three setae, incidentally, the only case observed where

the basipulvilli bear setae. The unguitractor and claws are not distinctive.

The similarity of the claw-segment of Ithone with that of the Blattids is evident and perhaps significant, for this insect is considered to be the most primitive of the Plannipennia. Comparison of Figs. 17, 18 and 19 illustrates why Ithone may be considered as annectant between Corydalis and Mantispa.

Mantispidae—Mantispa brunnea Say (Fig. 19)

The pretarsus of Mantispa is provided with a complicated type of arolium which has probably developed from a simple pad such as found in Ithone. Two fleshy lobes are supported by lightly sclerotized areas, indicated by broken lines, and at the base, posteriorly, are two ovoid sclerites also serving as supports. There is evidently no planta, a condition consistent with the light sclerotization of the planta in Ithone. At present it is impossible to interpret the significance of these various parts in Mantispa but it is hoped that other specimens of Neuroptera will make it possible to find homologies with the structures of higher insects. The basipulvilli are large and extend laterally a short distance along the membranes. The claws are broad and pectinate; the unguitractor differs considerably in outline from that of Corydalis or Ithone and bears a median ridge. It will be noted that the claw-segment of Mantispa is not comparable to that of Corydalis in any of its features and, in fact, the divergency of these two types is greater than any variations found in other orders, a condition which emphasizes the fact that the Neuroptera are known to be a highly diversified group.

ORDER MECOPTERA

Panorpa rufescens Rambur (Fig. 20)

The unguitractor is oval and bears a conspicuous median ridge such as is found in Mantispa; the claws are pectinate. A rod-like planta extends between the bases of the claws and the basipulvilli. The arolium is simple and is supported by a curved structure (cm) which is probably the same as the camera of Hymenoptera.

Order Trichoptera

Astenophylax argus Harris (Fig. 21)

The arolium is much like that of Panorpa and differs only in the curvature of the camera which is U-shaped in Astenophylax. The planta is also similar, that is, a narrow rod-like structure distad of the unguitractor. The basipulvilli are large and are located at the bases of the leathery pulvilli (pv) which are heavily fringed with long narrow scales. The claws are simple instead of pectinate and the median ridge is absent from the unguitractor,—two features in contrast to the condition in Panorpa.

Order Lepidoptera

Automeris io Fab. (Fig. 22)

The claw-segment of Automeris is very similar to that of Astenophylax and varies only in the narrower, curved pulvilli and the nature of the arolium which gives evidence of developing a secondary lobe. The condition in many Lepidoptera where the arolium is lacking has not been investigated.

This agreement between Lepidoptera and Trichoptera was to be expected, although such a complete resemblance is perhaps surprising. There are also certain features traceable to Panorpa. (see Figs. 20 and 22). It is conceivable that some Mecopteran will be found with traces of pulvilli which appear to be common structures in the orders Lepidoptera, Trichoptera and Diptera. There can be no question but what the condition in Panorpa approaches that of the Trichoptera and Lepidoptera more closely than it does the Neuropteran types, except for the absence of pulvilli.

Order Diptera

Tabanidae—Tabanus atratus Fab. (Fig. 23)

The unguitractor is broadly triangular and the pulvilli and basipulvilli are typical. The arolium is articulated with the unguifer and on the ventral surface its membrane is continuous with that surrounding the basipulvilli and unguitractor. This is the structure erroneously referred to as pulvilliform empodium; it is really an arolium. (Cramp-

ton 1923). The arolium of Tabanus is simple and lacks the supporting sclerite, or camera. For this reason there may be some question as to its strict homology with the arolium of Mecoptera, etc. described above. The absence of a planta may be significant as a similar absence was noted in Mantispid Neuroptera. On the other hand, the arolium is like that of Ithone in nature *i. e.,* its ventral surface is continuous with the membrane distad of the unguitractor) and the planta of Ithone is so lightly sclerotized that it is conceivable that in many related forms the planta would be entirely absent.

Asilidae—Diogmites umbrinus Loew. (Fig. 24)

This insect has no arolium but is characterized by the presence of a setiform empodium, a long chitinous setiform structure arising from the distal margin of the unguitractor. The pulvilli are also long and narrow and similar to those of Trichoptera and Lepidoptera, but the basipulvilli are small.

A study of more primitive Diptera may bring out some annectant features which will be significant in regard to the origins of this order. Thus far there seems to be more common features in the Neuroptera than in the Mecoptera.

Order Hymenoptera

Siricidae—Tremex columba L. (Fig. 25)

The unguitractor is long and grooved and the basipulvilli are very small; pulvilli probably do not occur in the Hymenoptera. Tremex lacks an arolium which is a complicated structure when present in this order. The planta bears four setae and the claws are provided with a large median tooth or spur. The orbicula (rb) is a dorsal sclerite which is here shown only in part.

Sphecidae—Chalybion cæreuleum L. (Fig 26)

The arolium, here shown extended, is normally folded back against the planta when not in use. Except for the paired lobes this structure is much like that of Panorpa especially in reference to the camera. The planta is provided with many small setae and the unguitractor differs

from that of Tremex in outline and absence of dorsal grooves. The claws are simple and the basipulvilli small. The orbicula, a small dorsal sclerite, is not shown in this view but this plate is variable throughout the Hymenoptera and together with the planta and unguitractor should prove valuable in studying the inter-relations within the order. As with the Diptera, it seems probable that further study of primitive types will be of phylogenetic value for the variety of structures does provide a wealth of material to work on.

Summary.

Without losing sight of the fact that only a few specimens selected at random from each order are studied, the evidence thus secured does seem to point out certain tentative hypotheses to be further investigated.

1. That the planta occurs in most of the insectan orders as a sclerotized area of the membrane just distal to the unguitractor and that this structure is homologous throughout by position, ie., its relation to the unguitractor, basipulvilli and claws. The presence of one or more setae may be a distinguishing feature; note the condition in cursorial Orthoptera and Hymenoptera. The degree of sclerotization is quite variable for in some cases the planta is almost entirely membranous while in others it forms a heavy plate.

2. That the empodium is a highly modified planta. No planta was found (in specimens so far observed) in the orders Diptera, Hemiptera, Coleoptera and Dermaptera but an empodium is present in at least some representatives of all these orders. On the other hand, wherever a planta occurs an empodium has not yet been observed. The condition of the planta in Gryllotalpa and Psalis, where it is closely associated with the unguitractor, illustrates how difficult an attempt to distinguish between these two structures may be. Comparison of Gryllotalpa with other Orthopteroids leaves but little doubt but what the part referred to is a planta even though numerous setæ are present, for such appendages also occur on the plantæ of cursorial Orthoptera and Hymenoptera. The occurrence of parempodia, which are really setae, on the empodia of Coleop-

tera and Hemiptera may also point to a close relation between these structures. These considerations, if supported by further investigation, indicate that the empodium is really a specialized planta, i. e., a planta which has become closely associated with the unguitractor and in some cases lengthened into a setiform process.

3. That the arolium or median pad-like structure occurring in many insects, although varying in complexity, is homologous throughout the orders. This structure is not of ordinal significance for it is present in some groups and absent from others within most orders.

4. That the small lateral sclerites (basipulvilli) are homologous in all orders; they form a support at the bases of the pulvilli when the latter are present and in such cases there is no question as to their homology. Many insects show these sclerites without the pulvilli but all other relationships are the same.

5. The problem of the origin of the pulvilli remains in doubt. Very possibly further study will support the suggestion of Crampton (1923) that they are membranous areas detached from beneath the claws. Thus far what evidence there is remains inconclusive, that is, briefly: the membranous claws of Ephemeroptera and the similar condition in certain Homoptera (Fig. 15); the pseudarolia of Miridæ which may be true pulvilli; the association of pulvilli and basipulvilli in Diptera, Trichoptera and Lepidoptera and the fact that the basipulvilli (if present) are always located at the bases of the flexor membranes in orders where typical pulvilli do not occur.

6. An interesting condition is that found in the orthopteroid insects. The similarity of certain anatomical features of the Blattidæ, Mantidæ and Isoptera is well known so that the agreement found in the claw-segments of these three groups is not surprising. The saltatorial Orthoptera, including the Phasmidæ, are also set apart as a coherent group by the nature of the pretarsus and the Dermaptera would seem to present a third Orthopteran type although less distinct and nearer to the Tettigoniids and Gryllids-plus coleopterous affinities.

7. That the planta and basipulvilli found in the Plecoptera would place this order with the Neopterygota rather than with such types as Odonata and Ephemeroptera in which parts as advanced as the above have not been found although the presence of an empodium in Odonata must be considered.

8. At this stage it is impossible to attempt any valid correlations between the types of pretarsi found in the higher orders other than such obvious relations as that of Trichoptera to Lepidoptera. However, it is evident that the variations of the several parts of the pretarsus found among the Holometabola, even in such a random selection of cases, warrant a thorough investigation of the condition in these orders with a view to possible clarification of the phylogenetic implications concerned.

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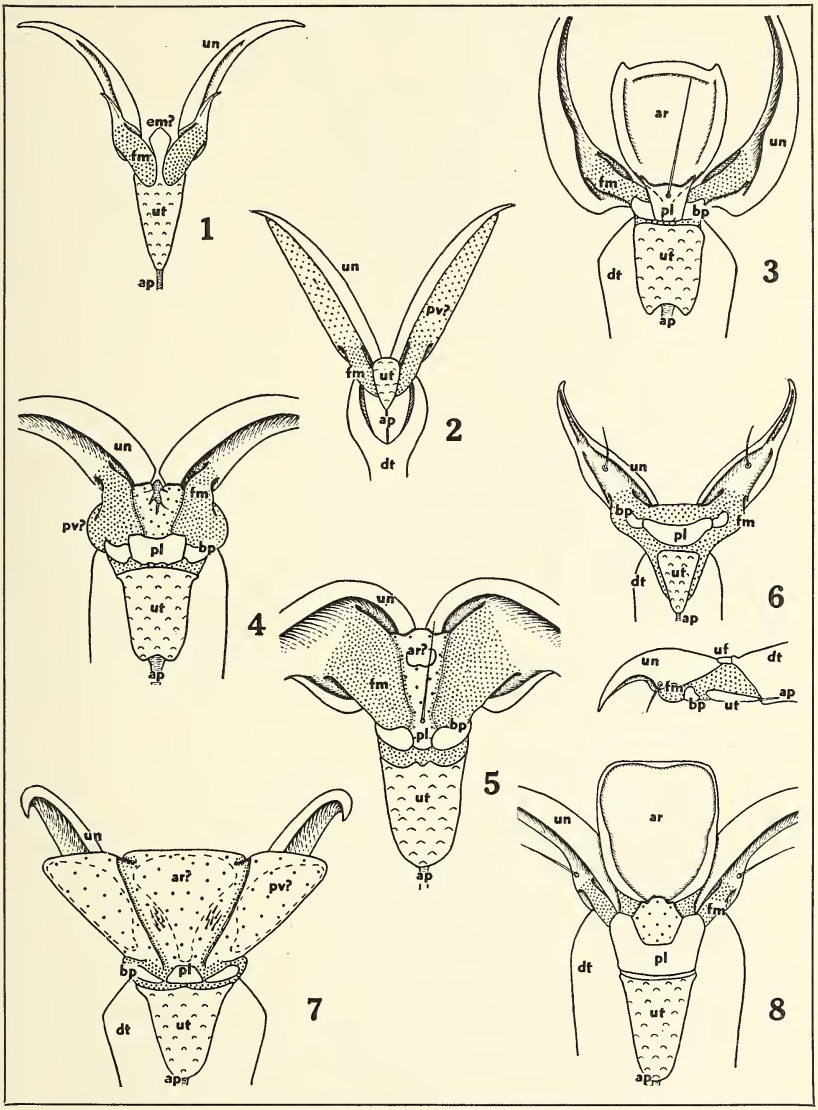

Fig. 1. *Anax junius* Drury.

Fig. 2. Siphlonurus sp.

Fig. 3. *Periplaneta americana* L.

Fig. 4. *Tenodera sinensis* Sauss.

Fig. 5. *Termopsis angusticollis* Walker.

Fig. 6. Oligotoma sp.

Fig. 7. *Pteronarcys dorsata* Say.

Fig. 8. *Melanoplus bivittatus* Say.

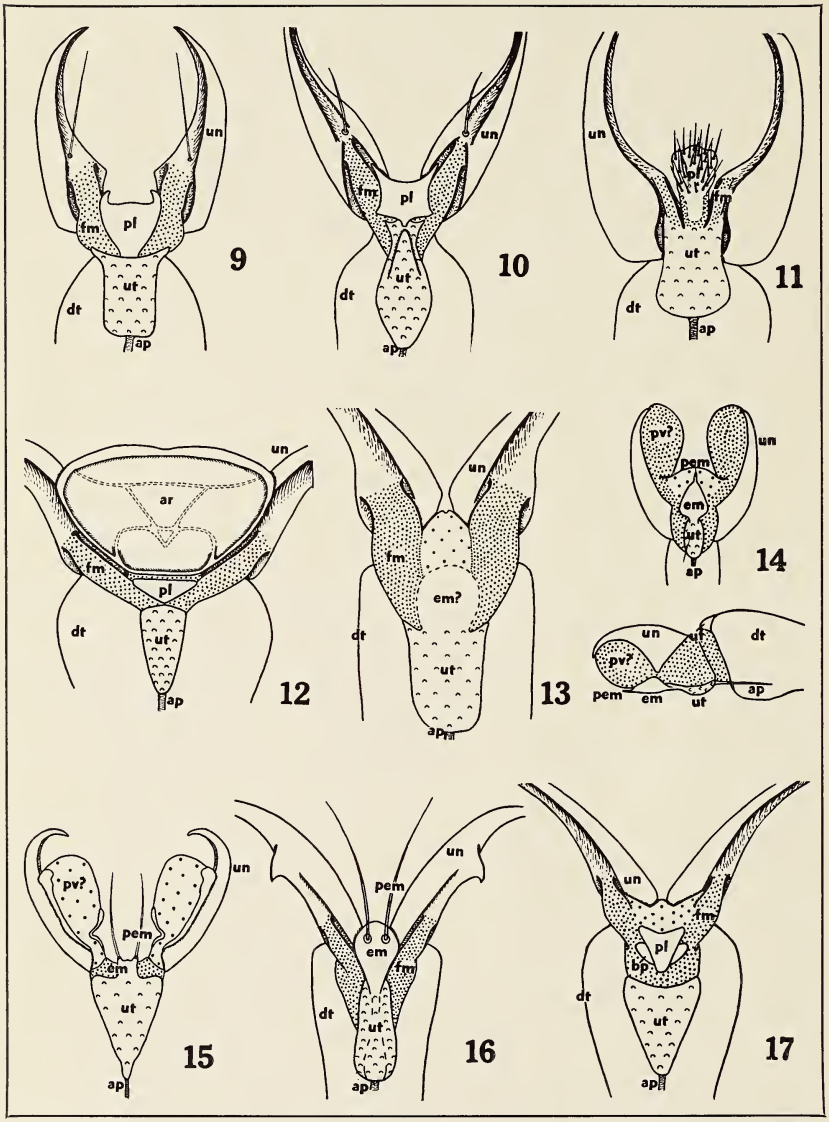

Fig. 9. *Ceuthophilus maculatus* Say.

Fig. 10. *Gryllus pennsylvanicus* Burm.

Fig. 11. *Gryllotalpa borealis* Burm.

Fig. 12. *Anisomorpha buprestoides* Stoll.

Fig. 13. Psalis sp.

Fig. 14. *Agallia constricta* Van Duzee, ventral and lateral views.

Fig. 15. *Brochymena arborea* Say.

Fig. 16. *Phyllophaga fusca* Froelich.

Fig. 17. *Corydalis cornuta* L.

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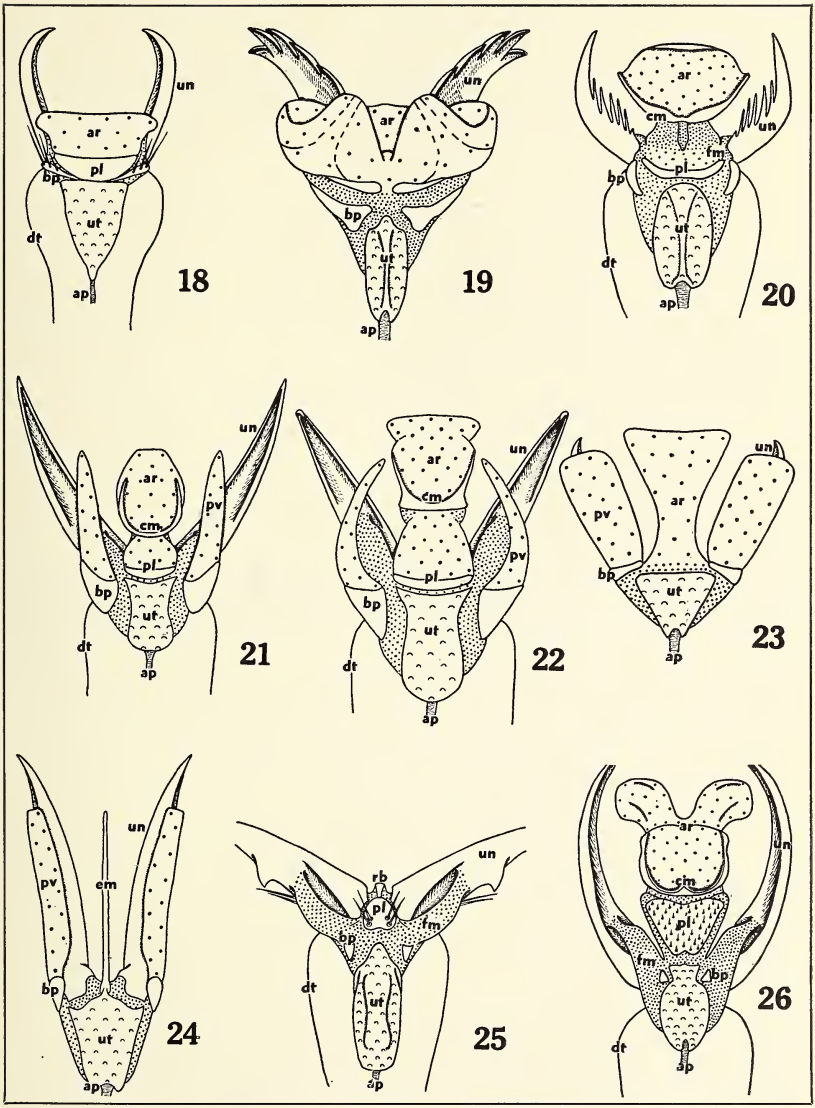

Fig. 18. Ithone sp.
Fig. 19. *Mantispa brunnea* Say.
Fig. 20. *Panorpa rufescens* Rambur.
Fig. 21. *Astenophylax argus* Harris.
Fig. 22. *Automeris io* Fabr.
Fig. 23. *Tabanus atratus* Fabr.
Fig. 24. *Diogmites umbrinus* Loew.
Fig. 25. *Tremex columba* L.
Fig. 26. *Chalybion caeruleum* L.

ABBREVIATIONS

ap — apodeme
ar — arolium
ar? — arolium (doubtful)
bp — basipulvillus
cm — camera
dt — distitarsus
em — empodium
em? — empodium (doubtful)
fm — flexor membrane
pem — parempodium
pl — planta
pv — pulvillus
pv? — pulvillus (doubtful)
rb — orbicula
uf — unguifer
un — ungues
ut — unguitractor

Except where otherwise noted the pretarsi figured were taken from the right meta-tarsus and are ventral views.

THE BIOLOGY AND MORPHOLOGY OF THE IMMATURE STAGES OF *MACROCERA ANGLICA* EDWARDS.

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The early stages of this fly are unknown and they are here described for the first time. The remarkable shape of the larva, resembling more a small earth-worm than the larva of a fly, makes it an interesting object of study.

The records of the British Museum show that the fly was found in the New Forest, Stocken Church, Crowborough and Welwyn. Moreover, I have seen specimens of this fly from Egypt in the British Museum. They were darker than the English type.

I found the larvæ of Macrocera under the loose bark of damp moist logs of oak, ash and elm in Richmond park and Epping forest near London. The bark was stripped gently, and the larvæ were found living separately each under its own web of saliva. The web is hygroscopic and on it are suspended droplets of clear fluid. The web consists of fine threads about three to four inches long. In constructing this web, the larva anchors one end of its slimy salivary thread to the bark; the head is then raised, and the thread is worked forwards and backwards. Inside the web, a stouter thread runs from one end to the other.

The movements of the larva are very characteristic. It glides with greatest ease and even with rapidity over the even surface of fungoid growth covering the bark. In doing so, it is assisted by the fine threads which it emits so as to bridge over these inequalities. It moves forwards and

backwards with equal facility. Sometimes it turns by reversing its head and gliding along its side.

When the larva is full-grown, it advances to one extremity of the web and forms outside it a curious little mass of silken matter, so irregularly formed that it is scarcely entitled to be called a cocoon. The body is then shortened and the thoracic region is markedly thickened. The skin of the larva splits along the mid-dorsal line and the pupa draws itself forward leaving the old larval skin behind. If undisturbed, the imago often remains quiescent for 3 to 4 days, but will rush out with amazing celerity at the slightest disturbance.

Luminosity

In a closely related species, *Ceroplatus sesioides*, Whalberg (1848) was the first to state that the larva and pupa of Ceroplatus were luminous. Norris (1894) gave an account of the luminosity of the New Zealand "glow worm." He further suggested that the light emitted from the larva helped to attract small insects which the larva readily devoured.

Wheeler and Williams (1916) described the luminous organs in the New Zealand "glow worm," *Bolitophila luminosa*[1] as consisting of "the dilated tips of the four malpighian tubules which appear as four curved luminous rods and therefore constitute the photogenic organ." Hudson (1926) stated that the light emitted was brighter on warm damp nights and brightest immediately before daybreak.

In Macrocera and Ceroplatus which I reared in my bedroom, I carefully looked for luminosity in the larval and pupal stages of these insects, for several nights, and in no case was it seen. It is probable that the luminosity in the European *Ceroplatus sesioides* recorded by Wahlberg was due to phosphorescent bacteria as is the case in certain chironomus larvæ.

[1]Dr. F. W. Edwards kindly sent me some larvae of the New Zealand "glow worm." From the morphology of the larva, it is clear to me that the larva is related to the European Ceroplatus and not Bolitophila. Hudson later introduced the name *Arachnocampa luminosa* for the New Zealand "glow worm."

Food of Macrocera

Most Mycetophilid larvæ feed on fungus spores, hence their old name Fungivoridæ. Some species are said to be carnivorous.

Norris, Wheeler and Williams attribute a carnivorous habit to the New Zealand "glow worm."

Hudson bred the larva in small tanks by feeding them with small flies which he regularly introduced. Thus, he said, "There was in fact practically nothing else in the tank which could have sustained the larva during the three and half months they have been in captivity and accounted for the speedy disappearance of the numerous flies so frequently introduced."

Cheetham recorded a carnivorous habit for *Polylepta leptogaster* and Hungerford stated that *Sciara coprophila* fed on the dead bodies of the adults of their kind.

Mansbridge and Buston showed that the droplets of fluid in the webs of Platyura and Ceroplatus contain oxalic acid of sufficient strength to kill insects coming in contact with it. The excretion of oxalic acid by such larvæ is unexpected as it is by no means a product of larval metabolism. Such excretion is an aid to their carnivorous habit.

I have examined by transparency several young Platyura, Macrocera and Ceroplatus and found their gut containing fungus spores. In two instances, I found the remains of some Collembola in the web of Macrocera, but such remains form a nice nidus for fungal growth. It is probable that these larvæ may be partly carnivorous and partly fungivorous.

The larvæ of *Polylepta leptogaster* and *Sciara coprophila* are undoubtedly fungus eaters. It is evident that the carnivorous habit in Mycetophilidæ should be restricted to the web spinning species, namely the Ceroplatinæ, Macrocerinæ and Platyurinæ.

Morphology

The mature larva (Fig. 1, Pl. 4) is 20 mm. long and 1.5 mm. broad. The dorsal surface is convex and the ventral is flat. The larva is more like a small annelid worm or as Dufour said of the larva of Ceroplatus, "Elle est larve de dip-

tère par sa partie antérieure et annelide par la reste du corps." The larva is yellowish in colour especially towards the posterior half. The anterior four and last body segments are moderately pigmented.

The integument is thin, polished and shining. The body of the larva is free from hairs except for six groups of sensory hairs situated in the three thoracic segments in direct relationship of the imaginal buds of the legs. Each group consists of four hairs of equal length.

The body of the larva is composed of 12 body segments; the first four of which are smaller and quite distinct from the rest. They are rectangular in shape and the sides are produced into small sacs. The skin of the other body segments is thrown into numerous transverse folds. Each fold is produced into a small sac at the sides. In preserved material, the last 8 body segments are difficult to make out on account of the transverse folds; thus in the closely related genus Ceroplatus, Réaumur thought the body segments were innumerable, while Husdon counted 19 body segments in the New Zealand "glow worn." The last body segment (fig. 8) is provided with two conical papillæ which are of variable size according to their state of turgescence.

The head (Figs. 2, 3) is quadrate, dark brown and partly retractile in the first body segment. The frontal plate is egg-shaped with the pointed end situated on the posterior margin. The latter shows two deep lateral emarginations. The lateral epicranial plates curve towards the ventral surface of the head and meet anteriorly leaving a bell-shaped area covered with transparent chitin (Fig. 3). Anteriorly, each plate sends two tongue-shaped pieces of chitin which articulate with the condyles of the mandible.

The antenna (an. Fig. 2) is convex and resembles a watch glass. It is supported by a strongly chitinised base and an annular band of chitin outside which four minute papillæ are present.

The eyes (E. Fig. 3) are small vestigial structures situated postero-lateral to the antennæ. Each consists of a transparent membrane overlying a layer of pigmented cells.

The labrum (Fig. 4) is supported by a well developed chitinised frame which adjoins the frontal plate. The lat-

eral ends of the frame articulate with two well developed arms (c.r.) which pass ventral to the labrum. Each arm is provided with a fan-shaped organ, composed of several curved teeth, whose forward and backward movements help to direct the food particles towards the mouth opening. The labrum is a fleshy hood-like protuberance extending forward and downwards to recurve within the mouth. It is provided with 8 pairs of dorsal papillæ.

The mandible (Fig. 5) is elongated and consists of a convex dorsal and a large flat ventral lamella. The dorsal lamella is provided with one tooth and a well developed prostheca at the inner basal angle. On the medial border, the mandible carries three teeth and a small rounded tubercle.

The muscles operating the mandible are well developed and consist of an abductor and an adductor muscle. The abductor muscle (ab. m. Fig. 5) takes it origin from the posterior and lateral side of the epicranial plate and consists of five bundles which converge towards the upper slender tendon which is inserted to the upper angle of the mandible. The adductor muscle (ad.m) arises partly from the lateral and partly from the ventral surface of the epicranial plate. The ventral and dorsal bundles converge towards the adductor tendon to be inserted at the inner basal angle of the mandible ventral to the prostheca.

The maxillæ lie ventral and parallel to the mandibles. Each maxilla (fig. 6) consists of two lobes. The inner lobe or maxilla proper is cultriform and carries seven teeth, the last of which is strongly chitinised and more rounded than the rest. The outer lobe is provided with an oval area anteriorly, which is covered with a transparent membrane and bears one large circular and five small sensory papillæ. The maxilla is produced posteriorly as a strongly chitinised rod which serves for the attachment of the adductor muscle. The two maxillæ are supported along their posterior border by two triangular plates—the maxillary plates (mx. pl. Fig. 3) —which meet along the mid-ventral line.

The maxilla is provided with an adductor and an abductor muscle. The first consists of several bundles which arise from the apex and lateral margin of the occipital foramen and are inserted to the rod-shaped process of the maxilla.

The adductor muscle takes its origin from the lateral side of the epicranial plate. It consists of several bundles which converge to a long slender tendon which is inserted to the outer basal angle of the maxilla.

The hypopharynx (Fig. 7) lies dorsal to the maxillæ. It consists of two horizontal and two vertical processes. The free ends of the latter are seen between the inner borders of the maxillæ (hy, Fig. 3). Following them anteriorly, they pass dorsal to the maxillæ, slightly diverging one from the other and end by articulating with the horizontal processes. The horizontal processes resemble chamois horns. They meet anteriorly at the mid-ventral line and support a semicircular membrane whose free border carries several sensory papillæ (sp. Fig. 7).

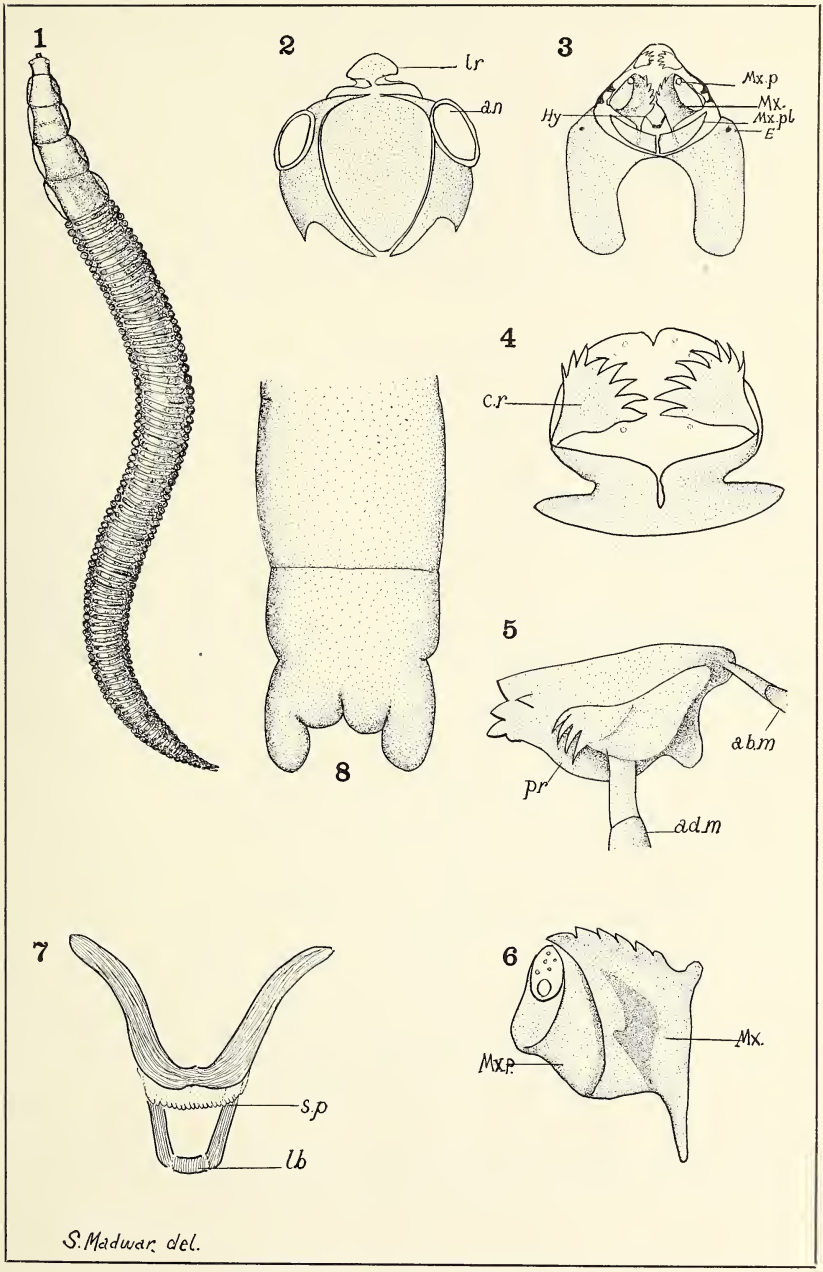
The labium (lb. Fig. 7) is reduced to a small rectangular plate situated between the free ends of the vertical processes. The opening of the salivary duct lies dorsal to the labium.

The alimentary canal consists of a short pharynx followed by a narrow tubular œsophagus which is invaginated in the proventricules. The mid-gut is in the form of a straight tube which gradually narrows down as it joins the hind-gut. The junction of the mid with the hind-gut is marked by four malpighian tubules which arise separately and extend forward, then backwards surrounding the hind-gut. From the anterior end of the mid-gut, two gastric cæca arise separately and extend backward to the 6th body segment. In the living larva, the cæca exhibit strong peristaltic movements. The two salivary glands are in the form of two long narrow convoluted tubes which extend to the 8th body segment. Anteriorly, they unite to form a common duct which opens between the distal ends of the vertical processes of the hypopharynx.

Respiratory System

The larvæ of Macrocera, Ceroplatus and Platyura are apneustic. The tracheal system is well developed in Macrocera, consisting of two latero-dorsal longitudinal trunks which extend from the first to the last body segment. The two trunks are connected together by 8 transverse branches situated at the end of the metathorax and the first seven

Psyche, 1935 Vol. 42, Plate IV.



Madwar — *Macrocera anglica.*

abdominal segments. From each trunk, eight short lateral branches take their origin, which are connected to the skin of the prothorax and first seven abdominal segments by means of lateral cords which correspond to the position of the spiracles in other Mycetophilid larvæ.

Although functioning spiracles are absent in this larva, the conditions for cutaneous respiration are extremely favorable[1]. The skin is thrown into numerous folds which increase the respiratory surface. The integument is thin and richly supplied with a subcuticular net of tracheoles. The larva lives under a hygroscopic web of salivary secretion.

Description of Plate 4

Macrocera anglica Edwards.

Fig. 1	Whole larva taken out of web	X 10
Fig. 2	Head — Dorsal aspect	X 72
Fig. 3	Head — ventral aspect	X 72
Fig. 4	Labrum — oral aspect	X 250
Fig. 5	Mandible	X 250
Fig. 6	Maxilla	X 250
Fig. 7	Hypopharynx and Labium	X 250
Fig. 8	Terminal body segment	X 72

Key to Lettering of Plate

An.	Antenna
Ab.m.	Abductor muscle
Ad.m.	Adductor muscle
C.R.	Chitinous ring
E.	Eye
Hy.	Hypopharynx
Lb.	Labium
Mx.	Maxilla
Mx.P.	Maxillary Palp
Mx.Pl.	Maxillary Plate
Pr.	Prostheca
S.P.	Sensory Papilla

[1]The modification of the respiratory system in some Dipterous larvae will be dealt with separately in a special paper.

Summary

1. The Biology and Morphology of *Macrocera anglica* is given.
2. Luminosity, development of carnivorous habits and the excretion of oxalic acid by the larva are discussed.
3. The change from the peripneustic to the apneustic condition in the larva of Macrocera is accounted for.

Acknowledgement

I wish to thank Prof. M. Khalil Bey, Director of the Research Institute, for his advice and helpful criticism.

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TWO NEW ANTS COLLECTED IN QUARANTINE

By W. M. Mann

National Zoological Park, Washington, D. C.

The writer has for some years had the privilege of seeing and identifying the ants collected at the various quarantine stations of the United States Government. These are intercepted from all parts of the world, and during the course of years a great many species have been received. There is of course a preponderance of certain common tropical species, but occasionally great rarities come in.

During the past year two most interesting species have been sent from the station at Honolulu, one a *Macromischa*, the other a second species of the genus *Zatapinoma*, both of which seem worth while recording here.

Macromischa luciliæ n. sp.

Worker (Fig. 1)

Length 2.75 mm.

Head a little longer than broad, slightly narrower in front than behind, with moderately convex sides, broadly rounded occipital corners and nearly straight borders. Clypeus, convex, truncate in front; frontal area large and strongly impressed. Eyes convex, situated slightly in front of middle side of head. Antennal scapes barely surpassing occipital corners; first funicular joint as long as the two following joints together; joints 2-9 sub-equal in length, slightly broader than long; club elongate; the terminal joint as long as the two preceding joints together. Thorax in profile very arcuate, without distinct sutures; epinotal spines stout, nearly straight, as long as the epinotal declivity. Postpetiole long and slender; the peduncle twice as long as the node, which rises abruptly and is higher than long and from above broader than the node and 1½ times as broad as long. Femora, especially posterior pair, thickened.

Head and thorax closely punctate and sublucid, the thorax and epinotum more closely than the head; petiole, post-

petiole and gaster shining; legs finely and densely punctate and shining. Hair moderately abundant on head, thorax and abdomen, erect and very coarse, whitish in color.

Color piceous except the anterior half of the epinotal spines which are ivory white; legs and antennæ somewhat lighter.

Described from a small series of workers taken in quarantine at Honolulu on roots of *Oncidium splendidum*, from Guatemala.

Fig. 1. *Macromischa luciliae* sp. nov. Worker. Profile view.

A very distinct species, superficially resembling *albaspina* from Mono Island, but much larger, more shining and with entirely different petiole.

Co-types No. 50802, U. S. National Museum.

Zatapinoma wheeleri n. sp.

Soldier (Fig. 2)

Length 2.75 mm.

Head nearly twice as long as broad and broader in front than behind, with straight parallel sides, broadly rounded occipital corners and very shallowly concave borders. Eyes elongate, very slightly convex with nine facets in their greatest longitudinal diameter. Mandibles large and thick,

their inner blades with five coarse teeth. Clypeus nearly straight at anterior border; surface at sides with two strong nearly parallel carinæ, the surface moderately convex. Funicular scapes extending about 5/8 the distance to occipital corners, slightly thickened apically; funiculi moderately enlarged toward the tip, the first joint longer than the second and third together; joints 2-10 broader than long; terminal joint longer than the two preceding joints together. Thorax robust, pronotum more than twice as broad as long, broader in front than behind and with nearly straight sides; mesonotum from above 1½ times as long as

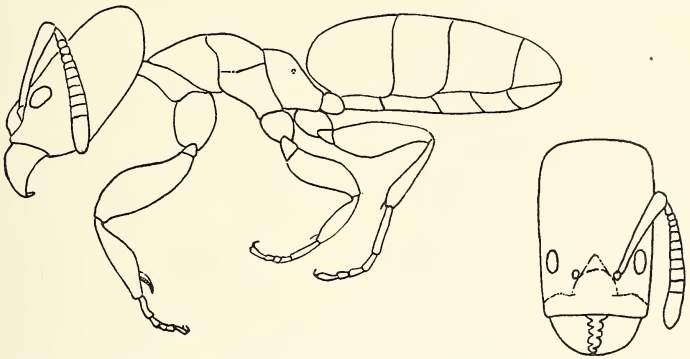

FIG. 2. *Zatapinoma wheeleri* sp. nov. Worker. Profile view and dorsal view of head.

pronotum, narrowed posteriorly; mesoepinotal suture very distinct; epinotum a little longer than broad in profile, with convex base and declivity; petiole sub-rectangular.

Moderately shining except mandibles and clypeus which are shallowly but densely punctate and opaque, the remainder smooth. Hairs very sparse, pubescence very fine and short, yellow in color, both abundant on head.

Color pale yellowish brown.

Described from three soldiers taken in quarantine at Honolulu on plants from Samoa.

Co-types No. 50801, U. S. National Museum.

The only other described species, *Z. annandalei*, recently described from India by Wheeler, differs in having the head broader, the mandibular teeth smaller and more numerous, and the clypeal area darker than the rest of head.

NEW ANTS FROM THE PHILIPPINES

By William Morton Wheeler

Biological Laboratories, Harvard University

The following species and subspecies are selected for description on account of their unusual interest from several rich collections of Philippine ants received from Dr. J. W. Chapman, Dr. F. X. Williams, Dr. R. C. McGregor and others.

Metapone gracilis sp. nov.

Female. Length 7 mm.

Head suboblong, about two-fifths longer than broad, slightly broader in front than behind, with feebly concave sides and somewhat sinuate posterior border. Eyes large, rather flat, about one and one-half times as long as their distance from the anterior corners of the head. Anterior ocellus distinctly larger than those of the posterior pair. Mandibles convex, with oblique, coarsely and bluntly 5-toothed apical and straight external borders. Median portion of clypeus trapezoidal, flat, sloping, slightly narrowed in front, with straight sides, posterior suture slightly arcuate, not impressed, anterior border only slightly projecting in the middle where it terminates in a pair of broad, blunt teeth. Frontal carinæ subparallel behind, their anterior lobes obtusely angular. Frontal groove distinct. Antennal scapes flattened, nearly four times as long as broad; club of funiculi large, flat, much longer than the remaining joints together, the terminal joint longer than broad, as long as the combined two preceding joints; joints 2-7 much broader than long but gradually increasing in length distally. Thorax slender, nearly four times as long as broad, subhexagonal from above, widest at its middle where the wings are inserted. Pronotum nearly as long as broad, with straight, anteriorly converging, scarcely submarginate sides. Mesonotum somewhat broader than long, flattened above, with arcuate promesonotal suture. Scutellum semicircular, flat. Epinotum longer than broad, in profile sharply

rectangular behind, the base feebly convex, about four times as long as the abrupt and slightly concave declivity. Petiolar node flattened above, about one and one-third times as long as broad, distinctly broader behind than in front, with sharp anterior and posterior corners, straight, marginate sides and anterior border and arcuately excised posterior border; in profile somewhat longer than high, the anterior surface of the nodes straight and perpendicular, the dorsal surface straight and horizontal, the posterior surface concave, the ventral surface anteriorly with a laterally compressed, triangular, translucent lamella and posteriorly with a thick, transverse projection. Postpetiole subelliptical, broader than long, somewhat broader than the petiole and slightly narrower in front than behind, its dorsal surface feebly convex in profile, perpendicularly truncated anteriorly, its ventral surface with a transverse welt anteriorly. Gaster slender, more than three times as long as broad, first segment decidedly longer than broad, the second broader than long. Legs short, shaped as in the other species, the flattened, middle and hind femora less than twice as long as broad. Wings short, measuring only about 4 mm.

Moderately shining mandibles coarsely striate-punctate; clypeus, head an throax evenly, longitudinally rugulose; pedicel and gaster finely reticulate, with coarse, sparse, piligerous punctures; scapes and legs smoother and more shining, with finer and more scattered punctures.

Pilosity yellowish, short and moderately abundant, oblique on the head and thorax, longer on the legs and abdomen, appressed or subappressed on the latter; anterior border of pronotum with a few conspicuously long, erect hairs. Wings covered with short, brown hairs.

Black; mandibles, clypeus, anterior borders of cheeks and posterior borders of postpetiole and gastric segments reddish brown; tips of scapes, funiculi, trochanters, basitarsi, tips and bases of femora and tibiæ more yellowish brown; remaining tarsal joints yellow. Wing membranes brownish; veins and peterostigma dark brown.

Described from a single specimen captured by Prof. C. F. Baker at Dapitan, on Mindanao Island, Philippines.

M. gracilis belong to the group of species comprising *bakeri* Wheeler of the Philippines, *tillyardi* Wheeler of New South Wales, *johni* Karawajew of Ceylon and *jacobsoni* Crawley of Sumatra and characterized by having the clypeus narrowed and blunt or bidentate anteriorly instead of terminating in a rectagular lobe with acute corners. Crawley mentions two female specimens under his description of *jacobsoni*, taken in April and October, 1914, respectively. The former he regards as the type of *jacobsoni*, the latter, which is very similar to the female described above, is, I believe, specifically different. There must be several closely related, still undescribed species of Metapone in the Indomalayan and Indonesian regions. I possess males of two species from Singapore and Luzon Island, which differ from the one I described as *hewitti* from Borneo, but I refrain from describing them till the cospecific females or workers turn up.

Prosopidris subgen. nov. (of Cardiocondyla)

Worker. Minute and closely related to Cardiocondyla. Antennæ very similar, but 11- instead of 12-jointed. Clypeus much larger, thick and swollen, perpendicularly truncated anteriorly and forming on each side a strong, oblique welt which bounds the antennal fossa. Thorax stout and rather high, evenly arcuate above in profile, without promesonotal and mesoëpinotal sutures and mesoëpinotal impression; epinotum armed with a pair of stout spines. Petiole much as in Cardiocondyla but the node more concave anteriorly; postpetiole large, broader than the petiolar node, as in that genus. Gaster consisting very largely of the first segment. Sting well-developed, short and stout. Middle and hind tibiæ without traces of spurs; tarsal claws very small, simple. Pilosity lacking except on the mandibles and clypeus; sculpture feeble as in Cardiocondyla.

Female. Not much larger than the worker and very similar to the female of Cardiocondyla in the structure of the thorax. Postpetiole not more enlarged in proportion to the petiolar node than in the worker. Wing-venation much as in Cardiocondyla with narrow pterostigma near the middle of the costal border, a single narrow cubital cell, no

discoidal cell, and only a short basal piece of the radial vein, but with a well developed discoidal vein.

Subgenotype: *Cardiocondyla* (*Prosopidris*) *sima* sp. nov.

Cardiocondyla (Prosopidris) sima sp. nov. (Fig. 1)

Worker. Length 2-2.2 mm.

Head subrectangular, longer than broad, nearly as broad in front as behind, with straight, subparallel sides, broadly rounded posterior corners and feebly sinuate posterior border. Eyes moderately large and convex, somewhat longer

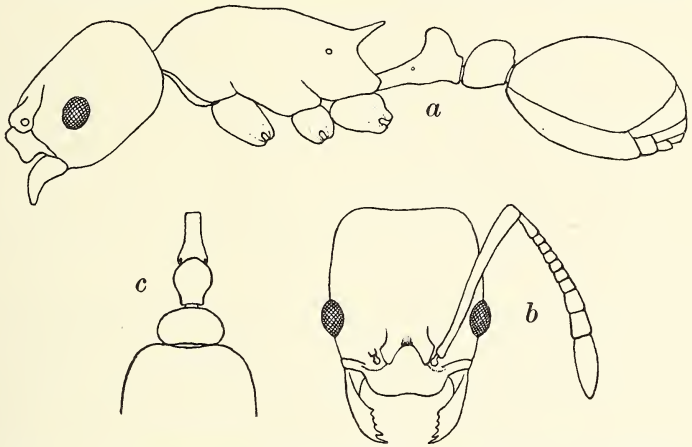

Fig. 1. *Cardiocondyla* (*Prosopidris*) *sima* sp. nov. Worker; *a,* in profile; *b,* head, dorsal view; *c,* petiole and postpetiole, dorsal view.

than their distance from the clypeus. Mandibles convex, 5-toothed, the two apical decidedly larger than the basal teeth. Clypeus projecting over the bases of the mandibles, its anterior truncated surface flattened, its posterior portion extending back between the frontal carinæ large, convex, subtriangular, its anterior border transverse, feebly sinuate in the middle and more deeply sinuate on each side. Frontal area small, triangular, impressed and rather indistinct; frontal groove distinct anteriorly. Antennæ slender, scapes nearly straight, extending somewhat beyond the posterior corners of the head; second funicular joint longer than broad, joints 3-7 as long as broad, the two basal joints

of the club longer than broad, subequal, together shorter than the distinctly swollen terminal joint. Pronotum with the neck as long as broad, with broadly rounded humeri; mesonotum broader than long, narrowed posteriorly where the pleuræ are distinctly compressed; epinotum longer than broad, slightly narrowed anteriorly, its posteriorly sloping base one and two-thirds times as long as the perpendicular declivity, which is concave in the middle and marginate on the sides, metasternal angles prominent but rounded, the spines straight, blunt and stout, nearly as long as the distance between their bases but shorter than the declivity, directed backward and outward and slightly upward. Peduncle of petiole as long as the node, which is as high as long, rounded above and distinctly broader than long. Post-petiole transversely elliptical, lower and nearly twice as broad as the petiolar node, convex anteriorly, with its straight posterior border. Gaster broadly elliptical, convex, with broadly concave anterior border. Legs rather long.

Thorax, pedicel and gaster distinctly shining, microscopically and superficially reticulate or punctulate; mandibles, clypeus, head and appendages more opaque, the head and anterior portion of pronotum more sharply and coarsely punctulate and also covered dorsally with shallow and not very distinct foveolæ.

Pilosity and pubescence yellowish, the former consisting of a few short, sparse, erect hairs on the clypeus and mandibles, the latter fine, dilute, appressed, longer and more distinct on the gaster and appendages.

Dull yellowish brown or pale ferruginous, the head very slightly darker, the mandibles, clypeus, peduncle of petiole and appendages slightly paler. Mandibular teeth dark brown.

Female. Length 2.7-2.8 mm.

Very similar to the worker; joints 3-7 of funiculi distinctly broader than long; thorax short, as broad as the head; pronotum somewhat flattened, broader than long, subtriangular anteriorly; epinotal spines shorter and stouter than in the worker, subparallel; petiole and post-petiole not enlarged as compared with the worker.

Sculpture and pilosity as in the worker except that the whole thorax above is foveolate-punctate like the head, and the thorax, nodes of pedicel and gaster are darker and less yellowish, being as dark as the head. Wings grayish; veins brown, pterostigma dark brown.

Described from eight workers and four females collected by Mr. L. M. Morato at Dansalan, on Lanao Island, Philippines, and received from Dr. J. W. Chapman.

Dilobocondyla chapmani Wheeler subsp. **rufobrunnea** subsp. nov.

Worker. Length 3.8 mm.

Differing from the typical *chapmani* in its slightly larger size, slightly more opaque surface throughout and in coloration, being dark brown, with the pronotum above paler and more rufous, the mandibles, except the teeth, the sides of the clypeus, scapes, first funicular joint and tarsi beyond their first joint, brownish yellow.

Female. Length 4.5 mm.

Very similar to the worker, but the gular surface of the head and the thorax are paler and more reddish than the head and gaster, the postscutellum and posterior portion of the mesonotum infuscated. Wings shorter than the body, whitish, with pale brown veins and dark brown peterostigma. The radial cell is short and closed, there is a single cubital but no discoidal cell.

Male. Length 4.3 mm.

Head broader than long, transversely elliptical, with large eyes and moderately large ocelli. Cheeks short and strongly converging anteriorly. Mandibles well-developed, flattened, 5-toothed, the two basal teeth small. Clypeus broad, feebly convex, its anterior border broadly rounded, entire, sinuate on each side. Frontal area large; frontal carinate short, low and subparallel. Antennæ long, 13-jointed; scapes very short, only about twice as long as broad; first funicular slightly longer than broad, not swollen, remaining joints cylindrical, the second twice as long as the scapes, the remaining joints shorter, except the last, which is nearly as long as the second and somewhat swollen. Thorax through the mesonotum somewhat broader than the head; pronotum

very short, mesonotum large and convex, with very pronounced notauli (Mayrian furrows); epinotum higher than long, with subequal base and declivity, the former distinctly convex, the latter flattened, perpendicular and marginate on each side. Petiole and post-petiole similar to those of the worker, but more slender. Gaster small, elongate-elliptical; genitalia exserted, the stipites rather large, lobular, rounded at the tip. Legs long and slender but the femora distinctly incrassated in the middle, though less so than in the worker.

Somewhat shining; mandibles finely reticulate; head longitudinally rugulose, the clypeus and frontal area more finely and more regularly than the cheeks, the rugules of which curve around the antennal fossæ. The interrugal spaces are sharply and finely reticulate as in the worker. Sculpture of thorax similar; pronotum transversely, mesonotum longitudinally rugulose; scutellum more coarsely reticulate-rugulose, pleuræ and epinotal declivity smoother. Petiole, postpetiole and gaster shining, smoother, only superficially and microscopically reticulate.

Pilosity longer than in the worker, the hairs tapering and flexuous.

Black; scapes, gaster, coxæ and femora dark brown; base of gaster above somewhat infuscated; tibiæ, tarsi and funiculi white; first funicular joint strongly, tibiæ feebly tinged with reddish brown; wings whitish, veins colorless, pterostigma pale brown.

Single worker, female and male specimens collected by Mr. W. D. Pierce at Victoria, Negros Oriental, Philippines, and received from Dr. J. W. Chapman.

Emery, in the "Genera Insectorum" (p. 241) described with a query a male specimen of an undetermined species of Dilobocondyla from Sumatra. The foregoing description of the male collected with the cospecific worker shows that he really had a male Dilobocondyla, probably belonging either to *D. sebesiana* Wheeler or to *D. karnyi* Wheeler.

Zatapinoma williamsi sp. nov.

Soldier. Length nearly 3 mm.

Very similar to the soldier of *Z. annandalei* Wheeler of

India but differing in the following characters: Integument thicker and more rigid, clypeal swellings somewhat less pronounced and not bilobed or biprotuberant on each side; mandibles with 8 coarse teeth, the first, second and fourth larger than the others, the seventh and eighth fused; frontal area obsolete; funicular joints 3-8 as long as broad (in *annandalei* distinctly broader than long); eyes distinctly larger, situated a distance equal to their greatest diameter from the posterior clypeal border, which is more distinct than in the Indian species. Thorax more slender, the pronotum as long as broad, the epinotum slightly longer than broad.

Sculpture and pilosity very similar in the two species, but the color of *williamsi* is different, being brownish yellow instead of whitish yellow, the mandibles and clypeus are concolorous with the remainder of the head and the second to fourth gastric segments are brown at the base.

Female. Length 3.5 mm.

Resembling the soldier, but the head is proportionally smaller and somewhat more narrowed anteriorly, the eyes though flat are much larger, twice as long as their distance from the anterior corners of the head. Ocelli well-developed, near the occipital border. Clypeus without the peculiar lateral swellings of the soldier, feebly convex in the middle, depressed on each side. Frontal area large and indistinct. Antennal scapes reaching to the posterior fourth of the head. Thorax collapsed, but apparently as broad as the head, with flattened mesonotum. Gaster large, shaped like that of the soldier. Wings long, the anterior pair with long closed radial cell, a single long cubital but no discoidal cell. There are no traces of a pterostigma.

Sculpture and pilosity much as in the soldier, but the pubescence is more abundant and longer, especially on the gaster and the segments of this region also bear sparse and rather long, coarse hairs. Wings pubescent.

Clypeus and thorax brown; antennæ, head and legs brownish yellow; gaster pale yellow, with a broad, dark brown basal fascia on each segment. Wings hyaline, with very pale yellow veins.

Single soldier and female specimens taken by Dr. F. X. Williams as Los Banos, Luzon Island, Philippines.

This species is very close to *Z. wheeleri* described and figured by Dr. W. M. Mann in the present issue of "Psyche" from soldiers received from Samoa by the Federal Quarantine Station in Honolulu. This species, however, has 5-toothed mandibles and the funicular joints 2-10 are distinctly broader than long as in *Z. annandalei*. As I am not certain that the two specimens collected by Dr. Williams are from the same colony, only the soldier is to be regarded as the type.

Acantholepis aurea Karawajew subsp. **punctaticeps** subsp. nov.

Worker. Length 2 mm.

Head subtrapezoidal, slightly longer than broad, distinctly narrowed anteriorly, with feebly convex sides and posterior border and rounded posterior corners. Eyes at the middle of the sides of the head, moderately convex, as long as their distance from its anterior corners. Mandibles convex, with 5 subequal teeth. Clypeus convex, carinate, with broadly rounded, projecting anterior border. Frontal area obsolescent; frontal groove distinct anteriorly. Antennal scapes extending about one-fourth their length beyond the posterior border of the head. Pronotum with rounded humeri and convex sides and dorsal surface, decidedly broader than long; mesonotum transversely subelliptical, one and one-third times as broad as long; metanotum about two-thirds as broad as the pronotum, with prominent, dorsally projecting spiracles; the mesometanotal impression short but pronounced; epinotum somewhat narrower than the pronotum, subrectangular, the base on each side with a pair of stout longitudinal projections which terminate posteriorly in very blunt teeth bearing the epinotal spiracles at their tips. Petiolar scale thin, its summit acute and almost semicircularly excised, so that its corners from two blunt, flattened teeth which are about twice as long as broad at their bases, its sides and anterior surface somewhat convex. There is no peduncle-like prolongation behind the node.

Mandibles and clypeus shining, feebly and microscopically reticulate, the former with a few coarse piligerous punctures, remainder of head opaque, densely and finely punctate; thorax, petiole and appendages subopaque, sculptured like the head but more superficially; meso- and metapluræ longitudinally rugulose; gaster smooth and shining.

Hairs white, sparse, erect and obtuse, present only on the body; scapes and legs with fine, appressed, pale pubescence.

Head and thorax dark reddish brown; gula, occiput and epinotum darker and more blackish; mandibles, scapes, mesonotum, trochanters, tips of femora and tips and bases of tibiæ yellowish brown; funiculi fuscous; tarsi yellow, with the last joint brown; gaster black.

Two specimens taken by Dr. J. W. Chapman, one at Baguio, Luzon Island (type locality) and one Dumaguete, Negros Oriental, Phillippines. The second specimen seems to be somewhat immature. I have attached this form to *aurea*, recently (1932) described by Karawajew from Bantam, at the western end of Java, because it seems to differ only in the decidedly thinner petiolar scale, different sculpture of the head and much darker coloration. *Aurea* was the first species of *Acantholepis* to be described from Indonesia, all the other known species of this rather large genus being confined to the Eurasian and African continents, except the Indian A. *rothneyi wabsoni* Forel which occurs in Formosa. There is among my Philippine material, however, yet another species which is here described.

Acantholepis chapmani sp. nov. (Fig. 2)

Worker. Length 2.5-2.8 mm.

Head suborbicular, convex and rounded behind, including the mandibles slightly longer than broad. Eyes large, convex, somewhat behind the middle of the sides; ocelli large and widely separated. Mandibles moderately convex, 5-toothed, the first and fourth tooth from the apex larger than the others. Maxillary palpi very long. Clypeus large, evenly convex, ecarinate, with rounded, entire and projecting anterior border. Frontal area transversely triangular; frontal groove distinct. Antennæ slender; scapes extend-

ing two-fifths their length beyond the posterior border of the head; all the funicular joints fully twice as long as broad. Thorax shaped as in *A. frauenfeldi* Mayr but the anterior portion of the mesometanotal constriction is broader, though decidedly longer and more slender than in *aurea punctaticeps*. Pronotum one and one-third times as long as broad, flattened or slightly concave above, with distinctly protuberant humeri. Mesometanotum twice as long as broad, narrowed in the middle and bearing at its poster-

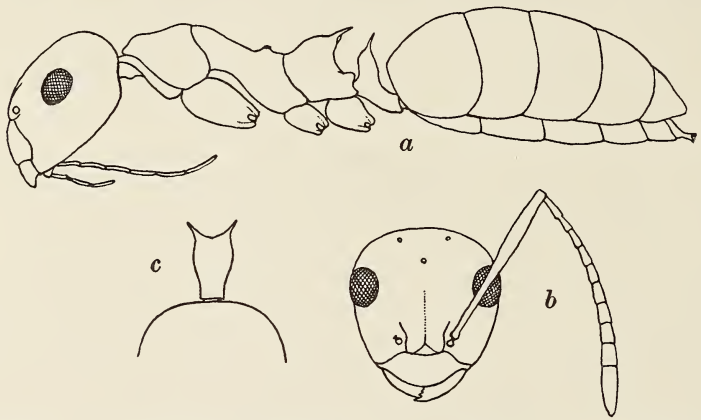

FIG. 2. *Acantholepis chapmani* sp. nov. Worker; *a*, in profile; *b*, head, dorsal view; *c*, petiole, posterior view.

ior fourth the dorsally projecting spiracles which are separated by a space four times their diameter. Epinotum from above subrectangular, nearly as broad as the pronotum and one-third broader than long, bearing on its anterior or basal half two large, thick, rapidly tapering, rather acute spines. Petiole long, with long posterior peduncle, the anteriorly placed scale inclined forward, convex anteriorly and posteriorly and moderately thick, bearing above at each corner of feebly concave, transverse summit a small, slender, acute spine which is directed upward, outward and slightly backward. Gaster rather large, subelliptical. Legs long and slender.

Shining and very finely and superficially reticulate or shagreened; meso- and epinotum more opaque and more

coarsely reticulate or densely punctulate and also sharply longitudinally rugulose, the rugules faint or absent anteriorly on the dorsal surface of the mesonotum; neck and posterior peduncle of petiole finely rugulose. Scapes and legs very delicately and densely punctulate.

Hairs and pubescence white, the former sparse, erect and rather short, most numerous on the head and gaster, absent on the appendages which are instead invested with fine, appressed or subappressed pubescence.

Yellow; meso- and epinotum, neck and posterior peduncle of petiole brownish; funiculi beyond the first joint, apical halves of hind femora, except their tips, and the tibiæ except their bases and tips, fuscous; mandibles, palpi and tarsi white; mandibular teeth reddish.

Female (deälated). Length 4.5 mm.

Resembling the female of *A. frauenfeldi,* but the head is proportionately smaller and broader, broader than long, subtrapezoidal. Antennæ shorter and stouter than in the worker. Thorax and petiole as in *frauenfeldi,* the former elliptical and depressed dorsally, with rounded, spineless epinotum, the latter with a decidedly thicker, spineless scale.

Opaque and much more sharply and densely punctulate throughout than the worker, except the thoracic sutures and an anteromedian impressed line on the mesonotum which are shining.

Pilosity much as in the worker but more abundant on the thoracic dorsum; pubescence distinct on the head, pronotum, gaster and legs; dense but rather short on the gaster.

Dull yellowish red; head somewhat paler; tarsi antennal scapes and first funicular joint yellow; remainder of funiculi brown; three broad, anteriorly fused vittæ on the mesonotum, the mesopleuræ, summit of petiolar scale, dorsum of gaster except the anterior portion of the first segment, dark brown or blackish.

Described from numerous workers and a single female taken by Dr. J. W. Chapman from two colonies nesting in galls on dead branches in the mountains near Dumaguete, Negros Oriental, Philippines.

Nesolasius subgen. nov. (of Pseudolasius)

Worker maxima. Resembling Pseudolasius but differing in the peculiar conformation of its mandibles, clypeus, frontal carinæ and eyes. Head large, subcordate, rather flat, deeply excised posteriorly. Eyes very small and indistinct, consisting of only a few ommatidia, in front of the middle of the head and on its dorsal surface as in Pseudolasius. Mandibles short, stout and convex, with only four very coarse, subequal teeth on the apical border, which is not oblique; the basal tooth apparently consisting of a fused pair of teeth. Clypeus very short, with a subrectangular median portion not extending back between the frontal carinæ, anteriorly abbreviated, with broadly concave anterior border, and short, band-like lateral portions extending to the sides of the head. Clypeal fossæ deep and pit-like. Frontal carinæ in the form of narrow lobes more closely approximated than in Pseudolasius, *sens. str.* conspicuously elevated, projecting above the surface of the head and bearing the antennæ beneath their anterior tips, bounded laterally by short scrobe-like impressions which are very narrowly confluent with the clypeal fossæ. Frontal area convex, lying between the frontal carinæ, continued posteriorly as a distinct median ridge instead of a groove and extending as far back as the middle of the head. Antennæ small, 12-jointed; scapes short. Thorax short and stout, shaped much as in Pseudolasius, with large, convex pronotum; metanotum distinct, with dorsolateral spiracles. Epinotal spiracles elliptical. Petiole, gaster and legs as in Pseudolasius.

Genotype: *Pseudolasius* (*Nesolasius*) *typhlops* sp. nov.

Pseudolasius (Nesolasius) typhlops sp. nov. (Fig. 3)

Worker maxima. Length 3.3 mm.

Head about one-fourth longer than broad, as broad in front as behind, with feebly and evenly convex sides and angularly excised posterior border. Eyes consisting of only 3 or 4 scarcely pigmented ommatidia. Clypeus convex in the middle, depressed on the sides. Antennal scapes reaching to the middle of the sides of the head; funicular joints 2-10 as long as broad, first joint as long as the three

succeeding joints together, terminal joint as long as the two preceding. Thorax including the neck about twice as long as broad, pronotum as broad as long; mesonotum convex, rounded subtriangular, broader than long; epinotum nearly as broad as the mesonotum, its base broader than long, rounding into the longer, feebly concave and nearly perpendicular declivity. Petiolar scale high, moderately thin, inclined forward, narrowed above, with rounded, entire, compressed superior border. Gaster elongate-elliptical. Legs rather stout.

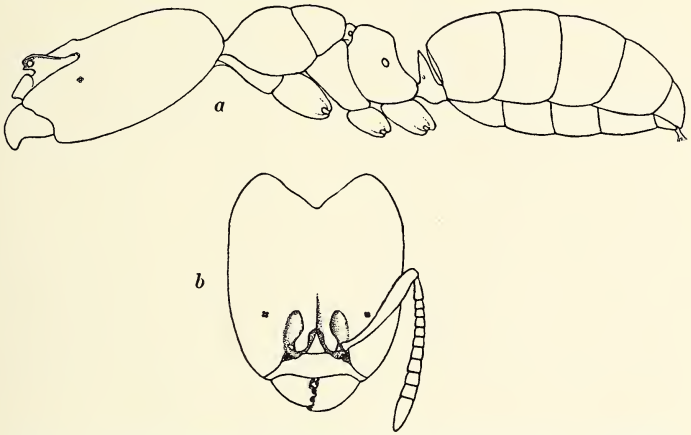

FIG. 3. *Pseudolasius* (*Nesolasius*) *typhlops* sp. nov. Soldier; *a*, in profile; *b*, head, dorsal view.

Mandibles, clypeus, thoracic dorsum and gaster shining, remainder of body subopaque, very finely shagreened, with fine piligerous punctures. Cheeks and antennal fossæ finely, longitudinally striate.

Hairs and pubescence pale yellow, the former long, erect and conspicuous on the gaster, shorter and much sparser on the head and thorax, long on the clypeus; hind tibiæ with a few long and oblique hairs on their extensor surfaces. Pubescence dense, especially on the head, thorax, scapes and legs, much more dilute on the gaster; appressed except on the thoracic dorsum.

Uniformly pale yellow, except the mandibles which are darker and more reddish, with black teeth.

A single specimen from Los Banos, Luzon Island, Philippines, taken by Dr. F. X. Williams in decaying wood.

The specimen is evidently a worker maxima. The anterior portion of its head is so unusual that it can hardly be assigned to Pseudolasius *sens. str.*, but whether Nesolasius will be regarded by other myrmecologists as an independent genus or as a subgenus of Pseudolasius may depend on the characters of the still unknown castes. Perhaps Forel's *Ps. amblyops* from the New Britain and his *sundaicus* from Sumatra should be assigned to Nesolasius. In the former the mandibles are 5-toothed and the eyes are reduced to a single facet. In *Ps. amaurops* Emery of New Guinea, which measures only 1.6-2 mm., the eyes are similarly reduced but the clypeus, frontal carinæ and 6-toothed mandibles show that it belongs to *Pseudolasius sens. str.*

A FEW NEW NORTH AMERICAN NEUROPTERA

By Nathan Banks

Museum of Comparative Zoölogy, Harvard University

In the course of determinations the following species have been detected and described as new.

Psammoleon arizonensis sp. nov.

In general similar to P. *sinuatus*, but smaller and separated by the marks of head, and the two dark marks on wings are not connected. In *P. sinuatus* the front edge of vertex is marked by a row of four distinct spots or scars, in this new species the median two scars are united into a large dark brown diamond-shaped mark; on the middle of vertex behind in *arizonensis* is a pair of small pale spots which in *sinuatus* are black spots united to the second vertex band. The pronotum shows, more or less plainly, the pale median line and two pale spots each side. The abdomen shows two pale above on each segment. The tarsi and claws are similar to P. *sinuatus*. The wings show the two oblique dark marks about as oblique as in *sinuatus*, but no connecting mark; the hind wings have a dark cloud on hind margin as in *P. sinuatus*.

Fore wings 26 mm. long, 5 mm. wide. Hind wings 24 mm. long, 4 mm. wide.

From Phoenix, 10, June; and Tucson, Arizona 25, July. (Streets collr.). Type M. C. Z. no. 20119.

Psammoleon decipiens sp. nov.

In general very similar to *P. guttipes*. Readily separated therefrom by the marks of the head. Above the interantennal mark is a transverse pale band above which is a velvety dark brown band from eye to eye, broader in middle, behind this on vertex another transverse pale band, and behind this another dark band (in *guttipes* the dark of interantennal mark extends up to the transverse row of four

pale scars). The forewings have the usual two oblique dark streaks, the first concave toward base and before each of these marks there is a large area of wholly white venation, much larger than in *P. guttipes*. The venation is very similar to *P. guttipes* but in fore wings the costal area is less broad and the costal crossveins less numerous, so that the costal cells are not nearly as narrow as in *P. guttipes*.

Size as in *P. guttipes*. From Millin, Scriven Co., Georgia, and Shreveport, Louisiana. Type M. C. Z. no. 20118.

Psammoleon parallela sp. nov.

Face yellowish, a large black interantennal mark, vertex dark, two black lines across the ridges from eye to eye, last joint of labial palpi moderately dark, not greatly enlarged; antennæ annulate with brown; pronotum dark, a few faint pale marks, a rather large one each side; meso— and metanotum dark, a few pale spots or streaks, mostly through middle; pleura mostly pale, a few brown marks above, with long white hair; abdomen dull black, three pale spots above on each segment, a median one before middle, and one each side toward tip, with very short white hair above, longer below toward base. Legs pale, black spots on femora, mostly above, near base and tip of tibia, and some between, tips of tarsal joints black. Wings not very clear; veins pale, marked with black mostly in streaks, many cross-veins wholly dark, especially toward tip and behind, costals dark at each end; stigma yellowish, blackish basally; a dark streak obliquely up from end of anal and cubital fork, another oblique dark streak at rhegma, on several cross-veins; hind wings with veins mostly pale, and the dark not so black. Wings rather more narrow than usual, not widened near stigma, tip rounded; seven cross-veins before radial sector in fore wing, one in hind wing; ten branches to radial sector in fore wing, nine in hind wing; six cross-veins before cubital fork in fore wing, the anal runs nearly parallel to the cubital fork for a greater distance than in other species, and connected to each other by seven to nine cross-veins; in hind wing at most one cross-vein between cubital fork and first anal vein, often none.

Length of body, 20 mm. Length of forewing, 25 mm,

width 5.2 mm. Length of hind wing, 25 mm., width 4.5 mm.

From Puerto Castillo, Honduras, (J. Bequaert); and Puntarenas, Costa Rica, 11-1907 P. Biolley, Philad. Acad. Nat. Science. Type M. C. Z. no. 20117.

Chrysopiella minora sp. nov.

Pale yellowish. Face with a brown stripe on each cheek down to the clypeus and there an inner extension; palpi marked with dark; no spot below bases of antennae, and no brown on lower sides of basal joints, but a stripe of brown on outer side of each basal joint, second joint dark brown, beyond the antennae are slightly dark. On front of vertex back of antennae is a fine curved dark line and on top of vertex two short dark stripes. Pronotum and rest of thorax unmarked, as well as legs. Wings with wholly pale venation, stigma more greenish. Wings very slender, more so than in other species, only eight radial cross-veins, only three or four in outer gradate series, the last of these not its length from margin, third cubital cell long, the divisory vein starting from middle of base of cell and ending beyond the end of the cross-vein above; twelve to thirteen costals before stigma.

Length of forewing 8mm., width 2.7 mm.

Umatilla, Oregon, 24 June, 1882 (S. Henshaw). Smaller and lacks dark marks of the face of other species. Type M. C. Z. 19439.

Boriomyia furcata sp. nov.

In my table (Psyche 1930, 224) runs to 11, but smaller than either and with quite different male genitalia. Face shining brown; basal joints of antennae dark, beyond pale, scarcely annulate; vertex dark, with a median darker line; pronotum with broad dark side margins and narrow median line, rest of thorax mostly dark but with sutures pale; legs pale, base and tips of front and mid tibiæ dark; abdomen dark above, pale below, above with erect pale yellowish hair, most prominent near tip. Forewings rather heavily marked with brown, tending to form many bands, more distinct over the first gradate series; veins dotted and spotted with dark and white.

Wings of moderate length and breadth; cross-vein between first radial sector and median vein is beyond fork of median, no cross-vein between first and second radial sectors near their bases, one between last radial sector and radius, that between median and cubitus is longer than that between cubitus and its fork; the first gradate series (of 6 or 7) form a nearly even series across, but very little disjointed, and less oblique than in related species. The male appendages are deeply forked.

Length forewing 8 mm., width 3 mm.

From Argentine Pass, Colo. (Cockerell). Type M. C. Z. 19436.

Allotomyia borealis sp. nov.

Pale yellowish; in the male the face is shining black, in the female with a transverse spot below antennae; pronotum dark on sides; mesonotum and metanotum dark above base of wings; abdomen brown; forewings marked with dark at the gradate series, and some spots toward base, and with marginal brown spaces alternating with white spaces; many of the veins with dark dots; hind wings wholly pale, without marks. Venation much as in *A. fidelis;* no cross-vein from last radial sector to radius, one from first radial sector to second near its base, and a little before the cross-vein from the first radial sector to the median vein; first series of gradates further out than in *A. fidelis,* as near to second series at these to the outer margin. Male genitalia very different from *A. fidelis;* seen from the side extremely broad toward base.

Length of forewing 8 mm.

A male from Hillsboro, N. H., 12 June. A female taken by Mrs. Slosson many years ago at Franconia, N. H. agrees in the markings of the wings. Type M. C. Z. 19437.

Megalomus uniformis sp. nov.

Body, antennae, and legs pale yellowish, unmarked; wings the same, but the gradate series are narrowly brown, and a dot on the connection of cubitus and median, and faint brown borders of apical forkings; the dark dots seen on the veins of other species are here practically absent; hind wings slightly embrowned around margin. Costal area

very broad at base, broader than in *M. moestus,* about as broad as *M. latus,* some of the costal veinlets toward base are forked twice; four cross-veins between the sub-costa and radius, one at base, two between the second and third radial sectors, and one near the stigma; seven radial sectors; first series of gradates further out than in other species, evenly oblique (not broken) and formed of thirteen cross-veins before it ends in a hyaline spot at hind margin; outer gradate series of ten cross veins, forming only a slight curve, and nearer to the first row than in allied species.

Length of forewing 7 mm.

From Brownsville, Tex. (Snow coll.) Type M. C. Z. 19438.

VARIETAL FORMS OF PERIPATUS IN HAITI.

By Charles T. Brues

Biological Laboratories, Harvard University

During the past year Dr. P. J. Darlington of the Museum of Comparative Zoölogy spent some time in the Republic of Haiti where he obtained extensive collections of insects and other arthropods. Among this material are four lots of Onychophora taken at separated localities, including altogether 23 specimens. Previous to this there seem to have been discovered in Haiti only two specimens of Onychophora. These were contained in collections made by Dr. William M. Mann in 1912 and were dealt with by the writer in a previous paper.[1]

On account of striking differences in color and in the form of the integumentary papillæ, I considered Mann's specimens to represent two species, one of these I regarded as a subspecies of *P. dominicæ* Pollard of which the typical form inhabits the Island of Dominica while two other varieties occur on Antigua and Porto Rico respectively. The other form was named *P. manni* after its discoverer.

A close examination of the material obtained by Dr. Darlington discloses the fact that there are other forms of Peripatus in Haiti which appear to be clearly distinguishable from one another and furthermore that these appear to occupy separated regions or different ecological situations. I find also that he has rediscovered the two forms taken by Mann in the vicinity of the type locality near Furcy.

In order to present more clearly the differential characters of these several very similar forms, the following table has been constructed. It will be seen that the characters used are quite probably of different value, at least in our present state of knowledge. The form and arrangement of

[1] Preliminary Descriptions of two new Forms of Peripatus from Haiti. Bull. Mus. Comp. Zool., Harvard, vol. 54, pp. 519-521 (1913).

the papillæ are subject to some individual variation, but on the whole seem to be reasonably constant. Variations in the form and attachment of the nephridial tubercles are also subject to but slight variation. On the other hand, such characters as the dentition of the mandibles and the number of leg-bearing segments are subject to sufficient variation to render them of lesser importance in the absence of other more distinctive characters. Nevertheless it seems that the characters used in the table are sufficient to indicate clearly that the several forms are racially distinct. This conclusion is borne out by very striking differences in the insect fauna of the several areas which have been observed by Dr. Darlington. The three moist mountain ranges from which the Peripatus come are separated by low, dry, highly xerophytic areas into which such animals are utterly unable to penetrate, and it is certain that no migration has occurred since such conditions became established. The failure of certain genera of flightless Carabidæ to bridge these gaps is clear evidence that these mountains are actually isolated after the fashion of true islands. In this respect Haiti is quite different from the other West Indian Islands on which Peripatus is known to occur since it affords clearly isolated mountain ranges. So far none have been discovered in Cuba, but two very distinct types are known from Jamaica, both inhabiting the extensive and continuous Blue Mountain Region in the eastern part of the Island. These appear to be very local in occurrence, and commonly associated at the same places. One, *P. juliformis,* var. *swainsonæ* Ckll. is a true Peripatus, but the second which occurs with it is a modified type now relegated to the genus Plicatoperipatus. The occurrence of Onychophora in Jamaica is, however, so far as known, restricted to the Blue Mountains as none have been discovered in other parts of the island.

I have hesitated to propose any new taxonomic names, but as the material seems to justify some recognition of the five more or less readily distinguishable forms known from Haiti, those not already named are regarded as varietal forms. In general body color all are essentially similar, very dark in life, but after preservation in alcohol showing

a very dark, beaded dorsal stripe the enlargements of which correspond to the body segments. Just lateral to the stripe is a narrow pale border which serves to render it quite conspicuous, especially in some specimens. The nephridial tubercles are practically of the same conformation in all of the forms. They are attached slightly or free from the third band which is emarginate and the fourth band is bent, but scarcely emarginate next to the tubercle.

Key to the Forms of Peripatus known from Haiti

1. Some of the primary papillæ on the integumentary folds clearly much larger than the remainder and arranged in such a way that one or several smaller ones are regularly interpolated between two large ones.....2.
   Primary papillæ variable in size but not showing a definite arrangement on the folds with regard to size, *i. e.*, the largest papillæ are not regularly spaced with reference to intervening smaller ones; very few or almost no accessory papillæ.....4.

2. A number of accessory papillæ present along the sides of the body folds.....3.
   Accessory papillæ very few in number, almost absent; 30-33 pairs of legs in the female; blade of mandible with 14 teeth.....*Peripatus dominicæ* Pollard, var. *lachauxensis,* var. nov.

3. A bright orange spot at each side of the head (sometimes white in specimens that have been bleached by preservation in alcohol) ; mandible with 11-12 teeth; 30-31 pairs of legs in the female.....*Peripatus manni* Brues.
   No pale markings of this kind present; body uniformly dark above, except for the shaded, dorsal pattern; blade of mandible with 8-10 teeth; 30-32 pairs of legs in the female.....*Peripatus dominicæ* Pollard, var. *haitiensis* Brues.

4. 28 pairs of legs in the female; mandible with 11 teeth.....
   Peripatus dominicæ Pollard, var. *basilensis,* var. nov.
   33-34 pairs of legs in the female; mandible with 9 teeth.
   Peripatus dominicæ Pollard, var. *darlingtoni,* var. nov.

Peripatus manni Brues.

Bull. Mus. Comp. Zoöl., vol. 54, p. 520 (1913).

Six females and one male from near La Vesite, La Selle Plateau, Haiti (5,000-7,000 ft.), September 16-23, 1934 (P. J. Darlington). These are practically from the type locality which is near Furcy that lies just to the north of Vesite, and they were taken at practically the same altitude. The females have from 30-31 pairs of legs, two with the former and three with the latter number. The single male has 29 pairs. The conspicuous pale spot at the side of the head is present in both sexes.

Peripatus dominicæ Pollard, var. **haitiensis** Brues.

Bull. Mus. Comp. Zoöl., vol. 54, p. 519 (1913).

Of this form Dr. Darlington secured eight females and two males at the same place as the previous species, which is again practically the type locality. The occurrence of the two thus together suggests of course that they may be only color forms of one another although no such condition has been found to prevail elsewhere in the group which now includes about one hundred species. Among the American forms only *Peripatus torquatus* has a color pattern similar to that of *P. manni;* in this case the spots are almost united to form a transverse yellow band behind the head, and appear to be a constant specific character. Morphological differences are slight, as indicated in the key, and the general arrangement of the of the integumentary papillæ is much the same although there are fewer accessory papillæ in *haitiensis.*

Peripatus dominicæ Pollard, var. **lachauxensis,** var. nov.

This form is represented by two specimens from Etang Lachaux, taken October 27, 1934 by Dr. Darlington at an altitude of less than 1,000 ft. This locality is in the southeastern foot-hills of the Massif de la Hotte in the southeastern peninsula of Haiti. It is much nearer to sea-level than any of the others and is consequently much drier. As indicated in the key this variety differs from the preceding forms by the almost complete absence of accessory papilllæ

on the body folds and an unusually large number of small teeth on the blade of the mandible.

This is based on a single female from Mount Basil in northern Haiti taken at an altitude of about 4,000 feet on September 9, 1934 by Dr. Darlington.

Peripatus dominicæ Pollard, var. **basilensis,** var. nov.

This specimen has only 28 pairs of legs and a single large embryo which we have been able to remove by dissection shows the same number. The sex of the embryo cannot be determined and may of course be male, but the female shows that this form has an unusually small number of legs. As indicated in the key this variety is distinguishable from the preceding forms by the arrangement of the primary integumentary papillæ.

Peripatus dominicæ Pollard, var. **darlingtoni,** var. nov.

This is represented by two females and one male from Massif de la Hotte in the southwestern peninsula of Haiti taken between Camp Perrion and Mafin at an elevation of about 3,000 feet. The locality is near that where the variety *lachauxensis* was taken, but at a higher altitude and consequently in the moist rain forest belt. It differs from that form by the arrangement of the primary papillæ as set forth in the preceding key and from the variety *basilensis* which it resembles more closely by the greater number of legs in the female.

A NEW HESPERID FROM HAITI (LEPIDOPTERA; RHOPALOCERA)

By E. L. Bell
Flushing, New York

Poanes batesi new species

Male. Upper side. Primaries with a conspicuous, oblique, narrow greyish stigma of two parts broadly bordered with black on each side, the upper part, slightly curved, extends from near the base of vein 3 to vein 2; the lower part is continued obliquely inward from vein 2 to about the basal third of vein 1. The costal margin to near the end of the cell and the cell itself are orange fulvous. Basal area of cell 1 orange fulvous, somewhat darker. Outer half of wing blackish brown, well sprinkled with orange fulvous scales. Three subapical orange fulvous spots in interspaces 6, 7 and 8. A triangular, semi-hyaline, pale orange fulvous spot in the base of interspace 3; a larger, irregular semi-hyaline spot of similar color lies outside the upper part of the stigma in interspace 2; in interspace 1 a prominent, though not sharply defined, narrow orange fulvous streak extends along vein 1 from the base of the stigma to under the semi-hyaline spot in interspace 2. Below vein 1 the inner margin is orange fulvous from the base nearly to the inner angle of the wing. Fringes blackish at the base, paler brown at the tip, except at the inner angle where they are orange fulvous.

Secondaries. Costal area above vein 7, abdominal fold and a narrow outer border are black, the rest of the wing orange fulvous, through which some of the black veins feebly show, at the end and along the lower edge of the cell more distinctly than the rest. Fringes orange fulvous with blackish scales at the base and which intermix with the orange fulvous at about the center of the wing border.

Under side. Primaries with the basal area, except at the costal margin, black, at the costal margin the base is bright

green. A narrow black streak corresponds to the upper part of the stigma, and the end of the cell is narrowly black. The costal margin from the bright green base to beyond the end of the cell, the cell itself, an area enclosing the two semi-hyaline spots of the upper side, are orange fulvous, from here a broad, irregular brown band extends to the margin of the wing. The entire apical area is heavily overscaled with bright green, through which the three sub-

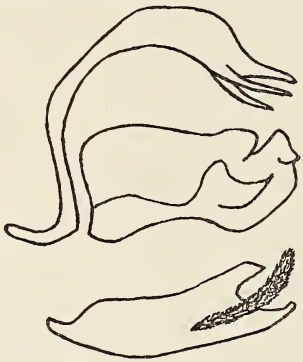

FIG. 1. *Poanes batesi* new species, male genitalia.

apical spots sometimes indistinctly show. The two semi-hyaline spots of the upper side are repeated but as they lie in an orange fulvous area they are less distinct than on the upper side. The streak in interspace 1 is larger than on the upper side and much paler in color. Below vein 1 the wing is brown. Fringes at the inner angle orange fulvous, above there brown to the apex, with whitish scales sparsely intermixed at the base, forming a basal line, which varies in distinctness with individuals, and may be entirely lost in very worn specimens.

Secondaries. The ground color is dark brown, heavily overscaled with bright green, except the abdominal fold which remains brown bordered on each side with orange fulvous scales. The green overscaling does not quite reach the outer margin of the wing and thus leaves a narrow marginal line of the dark brown ground color. A discal band of black spots, usually three, as follows: one, squarish or roundish, between veins 2 and 3, a small one above it be-

tween veins 3 and 4, and another small one between veins 6 and 7, which is sometimes absent, and in occasional individuals there is a fourth spot between veins 7 and 8. Fringes orange fulvous at the anal angle, above there brown at the base and orange fulvous at the tip; the white basal line more distinct than on the primaries.

Body above: thorax blackish; abdomen heavily haired with fulvous and greenish in the basal half, tip of anal tuft orange fulvous. Tegulæ and shoulder covers green. Head and collar green, sometimes with orange fulvous hairs intermixed. Eyes black. Antennæ black.

Body beneath: thorax and abdomen green and orange fulvous. Palpi and pectus green and orange fulvous. Antennæ spotted with yellowish between the joints, the club orange fulvous, apiculus reddish. Legs brownish with fulvous hairs.

Female. Upperside. Primaries dark brown, the basal area and below vein 1 overscaled with dark orange fulvous, the rest of the wing, except the end of the cell, more or less sprinkled with scales of the same color. A narrow orange fulvous streak near the base of the cell on the lower edge and sometimes another, less distinct, above it; both of these in some individuals are either absent or very indistinct. Two semi-hyaline spots in the apical third of the cell, one above the other and sometimes coalescent. Three semi-hyaline subapical spots in an oblique line in interspaces 6, 7 and 8, sometimes the middle one is a little inward of the other two. A semi-hyaline spot in each of interspaces 2 and 3 and an orange fulvous streak in interspace 1 similar to those of the male. All of the semi-hyaline spots mentioned above are tinted with pale orange fulvous. Fringes orange fulvous at the inner angle, above dark brown and orange fulvous intermixed.

Secondaries. Similar to those of the male but a little darker in tone.

Beneath. Primaries dark brown, except the costal margin which is green at the base and orange fulvous from there to the end of the cell and an orange fulvous spot in the end of the cell in which lies the two semi-hyaline spots of the upper side. The apical area is heavily overscaled

with green, the three subapical spots edged with white. The semi-hyaline spots in interspaces 2 and 3 are repeated and the streak in interspace 1 is much larger and paler than on the upper side. Fringes orange fulvous at the inner angle, above brown with orange fulvous tips, the white basal line often more distinct than in the male.

Secondaries. Similar in color to the male but instead of the discal band of black spots in that sex there is an irregular discal band of five silvery white spots, bordered outwardly with the dark brown ground color. The band of spots is composed of two sections, the lower part of three spots as follows: one below vein 2, one between veins 2 and 3 and one between veins 3 and 4, these are in a slightly curved line and the middle one is usually the larger. The upper section of the band consists of two spots, one between veins 6 and 7 and the other, usually the smaller, between veins 7 and 8. Fringes orange fulvous at the anal angle, above there brown, orange fulvous at the tip. The white basal line is very prominent.

The body and all appendages are similar in color to those of the male.

Expanse: male 32 - 34 mm.; female 32 - 36 mm.

Described from 15 males and 6 females collected by D. Marston Bates and P. J. Darlington on the La Selle Range, Haiti, during the latter part of September, 1934, and one female collected by Darlington near Mt. Hotte, Haiti, October 13, 1934.

Holotype male, La Selle Mts., September 23. Allotype female, La Selle Mts., September 20. Paratypes: 14 males, 5 females, La Selle Mts., September 18-23; 1 female, Roche Croix, La Hotte, October 13. The type, allotype, and 16 paratypes are in the collection of the Museum of Comparative Zoology, Cambridge, Mass., M. C. Z. 20141; 4 paratypes (2 males, 2 females) are in the collection of the author.

It is with pleasure that this beautiful species is named for one of its discoverers, Dr. D. Marston Bates, of the Museum of Comparative Zoology.

The mid tibiæ of *batesi* are feebly spined and this character together with the linear stigma and genitalic characters of the male seem to best ally this insect with those spe-

cies contained in the genus *Poanes,* where it would fall in the group comprising the former genus *Paratrytone* Dyar which was united with *Poanes* by Lindsey (University of Iowa Studies, ix, (4), pp. 84, 85, 1921). This section of the genus is represented in the North American fauna by *aaroni* Skinner and *yehl* Skinner, and in Mexico by *rhexenor* Godman, *polyclea* Godman, *aphractoia* Dyar and of these *batesi* is most nearly allied to the last four mentioned but is easily distinguished from them by the characters given in the above description, the green overscaling of the underside of the wings will alone separate it from any of the others. In addition, to date, none of the other species mentioned have been found in Haiti, the habitat of *batesi.*

Professor Nathan Banks in forwarding the specimens of *batesi* to the writer supplied the following important and interesting information concerning the region from which they came; he writes that the specimens from the La Selle Mountains were collected on the plateau of that range between 6,000 and 7,400 feet elevation, mostly in open pine woods or along the edge of cloud-forest in the vicinity of the peaks known as Cayes Jacques and La Vesita. The single female taken by Dr. Darlington near Mt. Hotte was found at an elevation of about 5,000 feet and the locality is about one hundred miles from where the other specimens were taken, with much low country between.

Batesi appears to be a species of the high altitudes and in this respect agrees with the Mexican species *polyclea* Godman and *aphractoia* Dyar, the type of the first mentioned said to have come from 8,000 feet elevation and that of the second from 13,000 feet elevation. The North American *yehl* seems to be a species of the low coastal areas although it does extend into Tennessee, but there are no altitude records available to the writer for that part of its habitat.

The figure of the male genitalia is taken from one of the paratypes from the La Selle Mountains.

MYRMECOLOGICAL NOTES

By William Morton Wheeler
Biological Laboratories, Harvard University

1. New Subgenera of Dolichoderinæ.

The genus Dolichoderus Lund (1831) now comprises more than 150 described species, subspecies and varieties. While revising these forms I have found it advisable to add to the number of subgenera recognized by Emery in his already somewhat antiquated fascicle on the Dolichoderinæ in the "Genera Insectorum" (1912). He accepted only three genera, Dolichoderus *sens. str.*, Monacis Roger (1862) and Hypoclinea Mayr (1855). The first and second restricted to tropical America, contain comparatively few species and are clearly defined. All the remainder were assigned to Hypoclinea, which is very heterogeneous and much more widely distributed, since it is represented in all the great zoögeographical regions, except Africa and Oceania. More recently (1926) Karawajew has established another subgenus, Diabolus, on what he erroneously supposed to be an undescribed species from Java. I adopt this subgenus, however, and propose three others for as many groups of East Indian, Papuan and Australian species formerly assigned to Hypoclinea. These subgenera, which are here listed are characterized like Dolichoderus *sens. str.* and Monacis, by peculiarities of the thoracic armature:

Monoceratoclinea subgen. nov. Subgenotype: *Dolichoderus* (*Hypoclinea*) *monoceros* Emery (1897). Other species: *D.* (*H.*) *tricornis* Emery.

Habitat: New Guinea.

Diabolus Karawajew (1925). Subgenotype: *Polyrchachis cuspidatus* F. Smith (1857) (This subgenus was based on *D.* (*Diabolus*) *bifurcatus* Karawajew, which is synonymous with *D.* (*H.*) *cuspidatus surbecki* Santschi (1925). Other species: *furcifer* Emery and *coniger* Mayr.

Habitat: Indonesia.

Diceratoclinea subgen. nov. Subgenotype: *Dolichoderus scabridus* Roger (1826). Other species: *beccarii* Emery, *angusticornis* Clark, *indrapurensis* Forel, *ypsilon* Forel.

Habitat: Australia and Indonesia.

D. cornutus Mayr of the Baltic Amber also belongs to this subgenus.

Acanthoclinea subgen. nov. Subgenotype: *Dolichoderus doriæ* Emery (1887). Other species: *edentata* Forel, *extensispinosa* Forel and *clarki* nom. nov. for *D. tristis* Clark (1930) *nec. D.* (*Monacis*) *tristis* Mann (1916).

Habitat: Australia.

Unfortunately, these subgenera only slightly reduce the number of species in Hypoclinea. We may follow Emery in distinguishing four geographical groups in this subgenus, a holarctic (to which the name Hypoclinea properly belongs, since the Eurasian *quadripunctatus* L. is the subgenotype) a Neotropical, an Indomalayan and an Australian, but I have not been able to discover in the workers any characters that would justify further subgeneric division. This may be possible when the sexual phases are better known. That the females may possess characters of taxonomic value is suggested by Acanthoclinea. Though colonies of this subgenus are not uncommon in Eastern Australia, no one has ever seen a winged female of any of the species. Very recently, however, Clark (Mem. Nat. Mus. Melbourne No. 8, 1934, p. 40, pl. 3, fig. 6) has described and figured a peculiar ergatoid female from a colony of *doriæ*. It is not improbable, therefore, that this is the typical and only form of female in the subgenus as it is in Leptomyrmex and several other Australian ant-genera.

2. The Tribe of Melophorini Forel.

According to Emery, (Gener. Insect. 1927), this the most primitive tribe of Formicine ants comprises only two genera, Melophorus Lubbock and Notoncus Emery, but it needs revision both by subdivision of the old genus Melophorus and by addition of two other genera. One of these is Myrmecorhynchus for which I made a special tribe in 1917. In this I was followed by Emery, but I am now convinced that Mrymecorhynchus is a Melophorine. Clark has recently

added another genus, Pseudonotoncus, which is related to Notoncus. I find that specimens of the type, *Ps. hirsutus* Clark, which long awaited description in my collection, have a typical Melophorine gizzard. *Diodontolepis*, a genus, which I based on *Melophorus spinisquamis* Ern. André in 1922, was again merged with Melophorous by Emery in 1927, but this was a blunder, as any myrmecologist who has seen specimens of the insect will admit. According to Clark, its habits too, differ from those of Melophorus.

The old genus Melophorus was divided by Emery into three subgenera: Melophorus *sens. str.*, Prolasius Forel and Lasiophanes Emery. In this he followed Forel (1911) who had declined to split the genus though he was impressed by the heterogeneity of the species, some of which he characterized as Cataglyphis-like, others as Pheidole-like and still others as Formica- and Lasius-like. I believe that Prolasius and Lasiophanes which have monomorphic lasiiform or formiciform workers should be regarded as distinct though very closely related genera of Antarctic origin. Up till 1934 only one species had been assigned to Prolasius, namely *P. advena* of New Zealand, but I found in 1931 that several of the Australian species placed by Forel and Emery in Melophorus clearly belong to Prolasius, and Clark has very recently described several others. The true Melophori, thus restricted to species with polymorphic workers, may be divided into three subgenera mainly on thoracic structure, namely Melophorus *sens. str.* comprising the Cataglyphis-like forms, Erimelophorus subgen. nov. the Pheidole-like forms with huge-headed maxima workers, and Trichomelophorus subgen. nov. for *M. hirsutus* Forel and its varieties. This subgenus is characterized also by peculiar sculpture and very long dense pilosity. The following therefore represents my conception of the generic and subgeneric composition of the tribe Melophorini:

Genus *Lasiophanes* Emery (1895).

Genotype: *Formica nigriventris* Spinola (1851). Other species: *bruchi* Forel, *bolivari* Santschi, *hoffmanni* Forel, *perplexus* Santschi, *picinus* Roger, *sauteri* Forel, *uxorius* Emery, *valdiviensis* Forel, *edwardsi* Donisthorpe, *negrensis* Donisthorpe, *rufoniger* Donisthorpe.

Habitat: Patagonia, Argentina, Chile.

Genus *Prolasius* Forel (1892).

Genotype: *Formica advena* F. Smith (1862) of New Zealand. Australian species: *depressiceps* Emery, *formicoides* Forel, *mjöbergiellus* Santschi, *nitidissimus* Ern. André, *scipio* Forel, *abruptus* Clark, *pallidus* Clark, *hemiflavus* Clark, *niger* Clark, *flavicornis* Clark, *hickmani* Clark, *rotundiceps* Clark.

Genus *Melophorus* Lubbock (1883).

Habitat: Australia.

Melophorus (subgen. emend.). Subgenotype: *M. bagoti* Lubbock (1883). Other species: *aeneovirens* Lowne, *curtus* Forel, *constans* Santschi, *iridescens* Emery, *insularis* Wheeler.

Erimelophorus subgen. nov. Subgenotype: *M. wheeleri* Forel (1910). Other species: *biroi* Forel, *fieldi* Forel, *marius* Forel, *mjöbergi* Forel, *omniparens* Forel, *pillipes* Santschi, *laticeps* Wheeler, *turneri* Forel.

Trichomelophorus subgen. nov. Subgenotype: *M. hirsutus* Forel (1902).

Genus *Diodontolepis* Wheeler (1922).

Genotype: *Melophorus spinisquamis* Ern. André (1896).

Habitat: Eastern Australia.

Genus *Pseudonotoncus* Clark (1934).

Genotype: *Ps. hirsutus* Clark (1934).

Habitat: Southeastern Australia.

Genus *Notoncus* Emery (1895).

Genotype: *Notoncus ectatommoides* Forel (1892). Other species: *capitatus* Forel, *enormis* Szabó, *foreli* Ern. André, *gilberti* Forel, *mjöbergi* Forel, *politus* Viehmeyer.

Habitat: Australia.

Genus *Myrmecorhynchus* Ern. André (1896).

Genotype: *M. emeryi* Ern. André (1896). Other species: *carteri* Clark, *musgravei* Clark, *nitidus* Clark, *rufithorax* Clark.

Habitat: Eastern Australia.

3. Some Preoccupied Names.

In addition to Karawajew's and Clark's homonyms cited above, I would call attention to the following, which I have discovered in my own writings on other genera:—

Acropyga (*Rhizomyrna*) *indosinenis* nom. nov. for *A.* (*R.*) *silvestri* Wheeler (1927) *nec. A.* (*Malacomyrma*) *silvestri* Emery (1915).

Nylanderia consuta nom. nov. for *N. dicroa* Wheeler (1934). *nec. N. dichroa* Karawajew (1933).

Camponotus (*Myrmocladoecus*) *sanctae-fidei weberi* nom. *nov. for C.* (*M.*) *sanctae-fidei darlingtoni* (Nov. 1934). *nec. C.* (*Myrmophyma*) *darlingtoni* Wheeler (Oct. 1934).

Ponera leæ norfolkensis nom. nov. for *P. leae oculata* Wheeler (1927) *nec Ponera oculata* F. Smith (1858).

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A FEW SOUTHERN SPIDERS

By Elizabeth B. Bryant

Museum of Comparative Zoölogy, Harvard University

During recent years, several small collections of spiders from Florida have been received at the Museum of Comparative Zoölogy and among them are a few new and little known species. All types are in the museum collection.

Gnaphosidæ

Herpyllus emertoni sp. n. (Pl. V, Figs. 1, 2.)

♀ 6 mm. long, ceph. 2.5 mm., abd. 4 mm.

Cephalothorax golden brown, with short, colorless hairs on the sides, thoracic groove long and distinct; eyes covering two thirds the width of the head, anterior row slightly recurved, a.m.e. largest of the eight, separated by a radius and almost touching the a.l.e., posterior row same length as anterior, slightly procurved, subequal, p.m.e. round, separated by a diameter and from p.l.e. by fully a radius, lateral eyes separated by radius of p.l.e.; quadrangle of median eyes higher than wide and a little wider in front than behind; clypeus less than a diameter of a.m.e.; mandibles brown, slightly attenuate, superior margin of fang groove with three teeth, median largest, inferior margin with one small tooth, labium higher than wide; maxillæ not twice as high as labium, slightly inclined over labium, margin straight with darkened edge; sternum oval, widest between II coxæ, pointed between IV coxæ; abdomen pale yellow, with scattered dark hairs; legs same color as cephalothorax with many long hairs, spines, I tibia beneath, 1 at tip, 1 median, metatarsus 1-1, basal, III tibia with a medium dorsal spine; epigynum dark, with two large oblique, oval areas

below the skin above a transverse depressed oval which has paired circular openings near the upper margin.

♂ 5.7 mm. long, ceph. 2.6 mm., abd. 2.8 mm.

Coloring and eyes same as in female; palpus seen from above, patella and tibia of about equal length, from below, tibia wider than long, tibial apophysis bent almost at right angle ending in a slender, sharp hook, palpal organ completely filling cavity, embolus straight and dark, origin near the base half hidden by a semi-transparent lobe which protrudes from the plane of the palpus, tip of embolous reaches nearly the end of cymbium.

Holotype ♀ Florida; Dunedin (W. S. Blatchley).

Allotype ♂ Florida; Dunedin (W. S. Blatchley).

Herpyllus floridanus (Banks) (Pl. V, Fig. 3.)

Prosthesima floridana Banks, Trans. Amer, Ent. Soc., 1896, 23, p. 61.

♀ 7 mm. long, ceph. 2.8 mm., abd. 4.3 mm.

Cephalothorax yellowish brown with scattered long black hairs, narrowed in front, thoracic groove short but distinct; eyes covering middle half of head, anterior row straight, a.m.e. largest of the eight, separated by their radius and almost touching a.l.e., posterior row slightly procurved, seen from above, a little longer than anterior row, p.m.e. oval, separated by their long diameter and by almost the same distance from p.l.e., lateral eyes separated by almost a diameter; quadrangle slightly wider in front and higher than wide; clypeus less than radius of a.m.e., margin with a row of long black hairs; mandibles brown with many long hairs, porrect and slightly attenuate, fang groove short, distinct carina on superior margin, no tooth or carina on inferior margin; labium once and a half times as high as wide, more than half as long as maxillæ; maxillæ two and a half times as long as wide, tips slightly widened, sternum light brown with scattered fine hairs, oval, at anterior end about twice the width of labium, pointed at posterior end, widest between II coxæ; abdomen yellowish gray, pale, covered with fine hairs; muscle spots distinct, venter pale, covered with fine hairs; legs, I right leg missing, anterior pairs darker than posterior, I leg short, metatarsus equals patella, I and

II metatarsi and tarsi scopulate, spines I and II tibiæ, beneath, 1 at tip, 1 median, metatarsi 1-1, basal, all spines short and inconspicuous, posterior tibiæ and metatarsi with many ventral spines, III tibia, 1 dorsal basal spine; epigynum a darkened oval area with a pair of oval depressions in posterior part separated by a darkened ridge, openings apparently a pair of circular pits separated by less than their diameter above the darkened ridge in the depression.

Holotype ♀ Florida, Punta Gorda (Mrs. A. T. Slosson).

Poecilochroa decipiens (Chamb.) (Pl. V, Figs. 4, 5.)

Sergiolus decipiens Chamberlin, Proc. Biol, Soc. Wash., 1922, 35, p. 151.

♀ 6.2 mm. long, ceph. 3.2 mm., abd. 3.2 mm.

Cephalothorax golden brown with scattered black hairs most numerous about eyes and posterior margin, thoracic groove short; eyes cover middle half of head, anterior row straight, a.m.e. largest of the eight, separated by less than a radius, and nearer to a.l.e., posterior row a little longer than anterior, slightly recurved, equidistant and subequal, p.m.e. round, lateral eyes separated by more than a diameter of p.l.e.; quadrangle of median eyes higher than wide and the same width behind as in front; clypeus higher than diameter of a.m.e. with a row of long black bristles near margin; mandibles a golden brown with many long black bristles, superior margin of fang groove with a broad tooth or carina, no tooth on inferior margin; labium very high and narrow, two thirds the length of the maxillæ; maxillæ slightly widened at tips, and not inclined over labium; sternum twice as long as wide, at anterior end little wider than labium, pointed between IV coxæ; abdomen brownish-gray, thickly covered with long hairs, two light bands, one basal and one about the middle, neither continued on venter, sides and venter brownish, thickly covered with hairs; legs same color as cephalothorax covered with short hairs, spines, I and II tibiæ, beneath, 1-1, at tip, 1 median, metatarsi, 1 basal, III tibia, 1 dorsal median spine; epigynum a pair of brown oval areas beneath the skin above a transverse oval depression with a pair of circular openings by the lower margin which are separated by at least three diameters.

Allotype ♀ Florida; Royal Palm Park, 1-18 April 1927 (W. S. Blatchley).

Both male and female were found at Royal Palm Park, Florida. The male is marked much like *Sergiolus variegatus* (Hentz) but it is smaller and the posterior eye row is less recurved so that the lateral eyes are closer together. The tibial apophysis of the palpus is pressed close to the tarsus until near the distal end when it bends outward as figured. In all males seen the thoracic groove is distinct. The epigynum is equally distinct from *Sergiolus variegatus* (Hentz).

Sergiolus tribolus Chamberlin (Pl. V, Fig. 6.)

Proc. Biol. Soc. Wash., 1922, 35, p. 153.

♀ 7 mm. long, ceph. 2.8 mm., abd. 4.5 mm.

Cephalothorax shining yellowish-brown with a few long black hairs, most numerous about the eyes, nearly twice as long as wide, no thoracic groove; eye area covering the middle half of the head, anterior row of eyes slightly recurved, a.m.e. slightly largest of the eight and separated by less than a radius, and from a.l.e. by less than half a radius, posterior row of eyes longer than anterior, slightly recurved, subequal, p.m.e., round, separated by at least two diameters and from p.l.e. by more than one, p.l.e. directed slightly backward, lateral eyes separated by more than a diameter of p.l.e.; quadrangle of median eyes wider behind and higher than wide; clypeus higher than diameter of a.m.e. with a row of long black hairs midway between margin and anterior row of eyes; mandibles yellowish-brown, covered with long black hairs, attenuate, no teeth on either margin of fang groove, fang groove short; labium twice as high as wide and more than half as long as maxillæ; maxillæ more than twice as long as wide, tips widened; sternum twice as long as wide, at anterior end only a little wider than labium, widest between II coxæ, pointed between IV coxæ which are separated by half a diameter, abdomn glossy black, without hairs except for a fringe at base, two white bands of equal width, one at base which does not meet and one about middle; sides and venter hairless, basal half of venter pale yellow which continues as a median tongue or lobe towards

the spinnerets, posterior half black; legs same color as cephalothorax and sternum, spines, femora with long dorsal spines, 1 tibia, beneath, 1 apical, metatarsus 1-1, basal, II tibia, 1 apical, 1 above the middle, metatarsus 1-1, basal, III tibia dorsal, 1 median spine near base, posterior legs spiny; epigynum dark brown, in lower part are two broad oval areas almost touching above a median transverse oval, very black between.

Allotype ♀ Florida, Sebastian, April 1934 (G. Nelson).

This species was made for one male from Punta Gorda, Florida, identified by Mr. Banks as *Sergiolus cyanoventris* Simon. This latter species was made from a female also from Florida. The original description is very brief and it is very probable that the two species are the same.

In 1891 Simon separated *Herpyllus variegatus* Hentz from the genus *Poecilochroa* because it lacked the thoracic groove and made for it the genus *Sergiolus*. Recently in examining all adult specimens of that species in the museum collection, the groove has been found, sometimes very short and faint, but always present. It is not easy to understand how such an error arose as Emerton figures the groove in his paper of 1890. In many of Chamberlin's species described as *Sergiolus* the groove is very distinct. Chamberlin states that it is "questionable whether this genus, *Sergiolus*, can be maintained apart from *Poecilchroa* with which it agrees closely in most structural features."

Drassyllus wallacei sp. n. (Pl. V, Figs. 7, 8.)

♀ 5.5 mm. long, ceph. 2.3 mm., abd. 3.2 mm.

Cephalothorax light brown with two parallel dark gray stripes extending from lateral eyes to posterior margin, heavily veined diagonally with black as striæ, narrow black marginal line and black about the eyes, thoracic groove long and distinct; eyes cover middle half of head, anterior row very slightly procurved, eyes subequal and equidistant, separated by a radius, posterior row slightly longer than anterior, procurved, eyes equidistant and subequal, separated by more than a diameter, p.m.e. round, not elliptical, lateral eyes separated by a diameter of p.l.e.; quadrangle of median eyes narrower in front and as high as width

behind; clypeus not as wide as diameter of a.m.e.; mandibles, right mandible missing, light brown with two parallel black stripes, superior margin of fang groove with two small teeth, inferior margin with one tooth; labium grayish, as high as wide, with rounded sides; maxillæ shaded with gray, more than twice as long as labium, sides almost parallel; sternum light brown, shaded with gray about margins, almost as wide as long, broadly truncate below labium and pointed between IV coxæ, widest between II coxæ; abdomen dark gray, bright brown at base divided by a narrow gray stripe, the brown gradually changing to gray; sides gray; venter light brown, mottled with gray which forms three vague stripes; legs, femora heavily banded with dark gray, patellæ and tibiæ gray, dorsally with two parallel light stripes separated by a narrow gray line, metatarsi and tarsi brown, spines, I tibia, beneath, 2-2, basal and median, basal pair almost half the length of the joint, metatarsus, 2-2; lower spinnerets separated by half a diameter; epigynum rather large, openings in upper margin, oval separated by their long diameter followed by a lobed figure with the margins heavily darkened.

Holotype ♀ Florida, Alachua Co., Wauberg Lake Station, 13 March, 1933 (H. K. Wallace).

Lycosidæ

Lycosa ornatipes sp. n. (Pl. V, Figs. 9, 10.)

♂ 9.2 mm., ceph. 6 mm., abd. 3.4 mm.

Cephalothorax with light median stripe, reddish between second and third eye rows, widening behind third eye row, then narrowing before thoracic groove with sides slightly converging, stripe does not reach posterior margin, eyes surrounded by black, very narrow marginal black line, sides chestnut brown covered with short, white hairs except for a small area back of third row of eyes where hairs are black; eyes, anterior row as long as second row, straight, a.m.e. separated by more than a diameter and a half, eyes of second row separated by a diameter; quadrangle of posterior eyes wider behind and as high as space between eyes of second row; clypeus as high as diameter of a.m.e.; mandibles yellow, covered with short, white and long, black

hairs, inferior margin of fang groove with three stout teeth, superior margin with two teeth, fang evenly curved; labium, maxillæ, sternum and coxæ pale, abdomen with a median black stripe, one third the width of abdomen, not reaching base and ending in front of spinnerets in a point, on each side and at the base is a white stripe, not as wide as the black, covered with short, white hairs, on each side a narrow black stripe which does not reach the spinnerets; venter with a median black spot from lung slits and surrounding the spinnerets, sides white, covered with white hairs; legs long and slender, pale, spines black and a few short, black hairs, I tibia black except for a narrow light ring at base and covered with short, black hairs, distal half of metatarsus black covered with black hairs, scopula on tarsi and distal half of metatarsi; palpus about as long as cephalothorax, light with terminal joint darker and covered with short, white hairs, tibia much longer than patella and about as long as terminal joint, palpal organ as figured.

♀ 16 mm. long, ceph. 8 mm., abd. 8 mm.

Cephalothorax with median light stripe, reddish but same shape as in male, does not reach posterior margin, sides chestnut brown, veined with black, covered with short white hairs, no marginal light stripe and area of black hairs behind third eye row much reduced; eyes same as in male; mandibles reddish mahogany with a few short, white hairs and long, black bristles; labium, maxillæ, sternum and coxæ light; abdominal markings not as distinct as in male, but the median dark stripe does not reach base and the lateral light stripes are poorly defined; venter, the black spot not as large as in the male and forms a triangle from the lung slits and does not reach the spinnerets; legs light and marked as in the male; epigynum of the usual inverted T type, median septum long, slender and slightly arched near the base, terminal cross piece about two thirds as long as the septum and wider, with a dark spot above at each end.

Holotype ♂ Florida; Alachua Co., Gainesville, Science Hall, 31 October 1933 (A. F. Carr).

Allotype ♀ Florida; Alachua Co., Biven's Arm, 6 May 1933 (H. K. Wallace).

The markings of this species are very distinct and quite

unlike any other species. The epigynum is not unlike *Lycosa fatifera* (Hentz) but that species has no thoracic or abdominal markings and the venter is light. The black first tarsus and metatarsus are very conspicuous.

Schizocosa duplex Chamberlin (Pl. V, Fig. 11.)

Bull. Mus. Comp. Zoöl., 1925, 67, p. 231.

♀ 6.5 mm.

Cephalothorax with a median stripe of yellow, narrower than the third eye row and extending between the eyes of that row, margins even and slightly converging, sides dark brown with many white hairs, a narrow light supramarginal stripe rather broken; eyes, anterior row shorter than second row, a.m.e. separated by nearly a diameter and from a.l.e. by a radius, eyes of second row separated by a diameter and a half; quadrangle of posterior eyes wider behind than high; mandibles dark with three teeth on inferior margin of fang groove; sternum dark with a light stripe in middle; coxæ light; abdomen with a converging median light stripe from base to spinnerets, usual basal spear mark within rather indistinct and posterior half of median stripe with indistinct cross bars, sides dark; venter light with a row of dark spots about sides meeting at the spinnerets; legs brown with very faint darker rings on femora, anterior patellæ and tibiæ darker; epigynum, the median septum very long and narrow, sides parallel, cross piece shorter than median septum and the upper section narrower than the lower, the division on each side about one third the length of the cross piece.

Allotype ♀ Florida; Sebastian, 1922 (G. Nelson).

The male was described from Fairfax, Virginia, in 1925. It differs from *Schizocosa ocreata* (Hentz) by the lack of a brush of black hairs on the first tibia and the shorter horn in the male palpus. The females differ from *S. ocreata* by the very long and narrow septum in the epigynum and the comparatively short division in the cross pieces. Specimens collected by Mr. H. K. Wallace from Alachua Co., Florida, have the median stripe on the abdomen very distinct and the basal spear mark and cross bars very faint, so that the abdominal stripe appears as a continuation of the median stripe on the cephalothorax. Hentz describes and figures

Lycosa venustula with similar marking and ventral markings on the abdomen of lateral converging lines of dark spots but until more specimens are collected from Alabama and South Carolina, the region from which Hentz had his material, it is thought best to leave this species as *Schiozocosa duplex*.

Pardosa ocala sp. n. (Pl. V, Fig. 12.)

♀ 4.6 mm. long, ceph. 2.2 mm., abd. 2.6 mm.

Cephalothorax with a median light brown stripe extending between p.l.e. half way to the second eye row, widening to almost the width of p.l.e. and gradually narrowing to posterior margin, on each side a lateral dark stripe with numerous diagonal cross lines of black, submarginal light stripes almost as wide as dark stripe continue to clypeus, a narrow marginal dark line; eyes surrounded by black, anterior row shorter than second row, a.m.e. larger than a.l.e., separated by less than a diameter and from a.l.e. by a radius, eyes of second row separated by almost two diameters; quadrangle of posterior eyes wider behind and not as high as width in front; clypeus below a.m.e. twice diameter of a.m.e.; mandibles yellow with scattered long bristles, inferior margin of fang groove with three teeth; sternum yellow with three pairs of black spots about margin and an irregular black line from middle to posterior tip; abdomen with the usual basal spear mark very indistinct in a yellow stripe which extends from base to spinnerets, basal spear mark outlined by well separated black dots, followed by four pairs of small black dots on posterior half forming converging rows, each dot surrounded by bright yellow, each side of yellow stripe a gray stripe of the same width, sides and venter light; legs light with vague dark rings most distinct on femora, base of each dorsal spine surrounded by black, all spines unusually long, basal pair on first tibia more than half the length of the joint; epigynum with median septum narrow at its origin at the cross piece, widening but not reaching the anterior end.

Holotype ♀ Florida; Alachua Co., Hale's Siding, 14 October 1933 (H. K. Wallace).

Paratype ♀ Florida; Lake Co., 9 October 1933 (H. K. Wallace).

Psyche, 1935 Vol. 42, Plate V.

Bryant—Southern spiders

The spines on the anterior tibiæ are much longer than is usually found even in this genus and the clypeus is higher, two characters noted by Tullgren in his description of *Pardosa longispina,* but the epigynum is very unlike the figure given for that species. The specimen from Lake Co. is darker but the markings are the same with submarginal light stripe continuing on the clypeus and the epigynum is the same with the median septum widening and not reaching the anterior end. Both specimens have egg sacs.

Explanation of Plate V.

Fig. 1. *Herpyllus emertoni* sp. n.
Fig. 2. *Herpyllus emertoni* sp. n.
Fig. 3. *Herpyllus floridanus* (Banks).
Fig. 4. *Pœcilochroa decipiens* (Chamb.).
Fig. 5. *Pœcilochroa decipiens* (Chamb.).
Fig. 6. *Sergiolus tribolus* Chamb.
Fig. 7. *Drassyllus wallacei* sp. n.
Fig. 8. *Drassyllus ornatipes* sp. n.
Fig. 9. *Lycosa ornatipes* sp. n.
Fig. 10. *Lycosa ornatipes* sp. n.
Fig. 11. *Schizocosa duplex* Chamb.
Fig. 12. *Pardosa ocala* sp. n.

NOTES ON THE MYCETOPHILIDÆ WITH DESCRIPTIONS OF NEW SPECIES

By Frank R. Shaw

Cornell University, Ithaca, N. Y.

In working over material preparatory to writing the chapter on the Mycetophilidæ to be published in the Diptera of Connecticut, a few observations were made that are belived to be best published before that work appears.

Not a great deal of work has been done in this country on this group of insects since the appearance of the Genera Insectorum fascicle by Johannsen in 1909. Later, in a series of bulletins published by the Maine Agricultural Experiment Station, the same author gave keys to all of the known species occuring in this country.

Since that time Edwards of the British Museum has done the most outstanding work in the group. He revised the family in 1924 and as it is the belief of the writer that the paper of Edwards is not easily accessible to the average worker on Diptera, it is considered to be worthwhile to give a summary of Edwards' revision, giving the arrangement of the group according to Johannsen and comparing it with the classification of Edwards.

In Johannsen's revision of the group, nine subfamilies were recognized. According to Edwards' grouping there are ten subfamilies but they are not equivalent in all cases to those of Johannsen which bear the same name. Since it is the belief of the writer that there are many of the same or closely related species occuring both in Europe and in America, it is felt that a classification should be adopted which is uniform. Consequently, the revision of Edwards is being followed in this paper. The following table lists only those genera found in North America:

Subfamilies and Genera (Johannsen)	Subfamilies and Genera (Edwards)
Subfamily Bolitophilinæ	Subfamily Bolitophilinæ
Bolitophila	Bolitophila
Hesperinus	
Subfamily Pachyneurinæ	
Subfamily Mycetobinæ	Subfamily Ditomyiinæ
Mycetobia	
Palæoplatyura	
Ditomyia	Ditomyia
Symmerus	Symmerus
Subfamily Diadocidiinæ	Subfamily Diadocidiinæ
Diadocidia	Diadocidia
Subfamily Ceroplatinæ	Subfamily Ceroplatinæ
Asindulum	Asindulum
Ceroplatus	Ceroplatus
Cerotelion	
Hesperodes	Hesperodes
Apemon	Apemon
Platyura	Platyura
	Palæoplatyura
Subfamily Macrocerinæ	Subfamily Macrocerinæ
Macrocera	Macrocera
Subfamily Sciophilinæ	Subfamily Sciophilinæ
Monoclona	Monoclona
Eudicrana	Eudicrana
Tetragoneura	Tetragoneura (in part)
Sciophila	Sciophila (in part)
Paratinia	Paratinia
Polylepta	Polylepta (in part)
Empalia	Synapha
Dziedzickia	Dziedzickia (in part)
Neoempheria	Neoempheria
Mycomya	Mycomyia
	Allocotocera
Diomonus	Leptomorphus
	Neuratelia
	Syntemna
	Phthinia
	Megalopelma

Sciophila	Sciophila
	Acnemia
	Azana
	Speolepta
	Cœlosia
Hadroneura	Hadroneura
	Gnoriste
	Boletina
	Rondaniella
	Leia
	Pnyxia
	Docosia
	Megophthalmida
	Ectrepesthoneura

Subfamily Mycetophilinæ	Subfamily Mycetophilinæ
Gnoriste	
Probolæus	
Acnemia	
Azana	
Rondaniella	
Odontopoda	
Leptomorphus	
Allocotocera	
Boletina	
Leia	
Phthinia	
Cœlosia	
Syntemna	
Megophthalmidia	
Docosia	
Anatella	Anatella
Trichonta	Trichonta
Cordyla	Cordyla
Brachypeza	Brachypeza
Rhymosia	Rhymosia
Allodia	Allodia
Phronia	Phronia
Telmaphilus	
Exechia	Exechia
Dynatosoma	Dynatosoma
Opistholoba	
Epicypta	Epicypta
Mycothera	
Mycetophila	Mycetophila (in part)

Sceptonia	Sceptonia
Zygomyia	Zygomyia
Delopsis	Delopsis
Subfamily Sciarinæ	Subfamily Sciarinæ
Eugnoriste	
Manota	
Pnyxia	
Trichosia	Trichosia
Zygoneura	Zygoneura
Metangela	
Phorodonta	Phorodonta
Rhynchosciara	
Sciara	Sciara

The chief difference between the classification of Johannsen and that of Edwards will be noted in the limits of the two subfamilies Sciophilinæ and Mycetophilinæ. Johannsen, 1911, recognized that there were two quite distinct groups in the Mycetophilinæ and gave a classification of these two series based on the arrangement of setulæ on the wing. Edwards, 1924, become convinced that a more natural grouping would be obtained by placing the genera included in Series I of the Mycetophilinæ of Johannsen in the Sciophilinæ.

Since some of the genera have been split or united with other genera since the date of Johannsen's work, I believe it best to mention the more important changes that have occurred.

1. The genus Hesperinus was removed by Johannsen to the Bibionidæ.

2. Pachyneura is now placed in a separate family related to the Anisopodidæ.

3. Mycetobia is placed with the Anisopodidae by some authors or in a distinct family the Mycetobiidæ.

4. Palæoplatyura is placed with the Ceroplatinæ by Edwards.

5. Cerotelion is considered to be a subgenus of Ceroplatus.

6. Diomonus is united with the genus Leptomorphus.

7. Megalopelma includes one species of the genus Phthinia and probably will include some of the North American species of Sciophila.

8. Speolepta was erected for *Polylepta leptogaster* of Winnertz.

9. Ectrepesthoneura includes those species of Tetragoneura having the cubital fork near the base of the wing. According to Garrett, this genus is not valid but as the writer has not seen the evidence to support this view, he does not care to make any decision.

10. Probolæus is united with the genus Lygistorhina of the subfamily Lygistorhininæ.

11. Manota is placed in a distinct subfamily the Manotinæ.

12. Telmaphilus is united with the genus Phronia.

13. Opistholoba is united with the genus Mycetophila.

14. Mycothera is united with the genus Mycetophila.

15. Pnyxia is considered to belong with the Sciophilinæ according to Edwards.

In the course of the investigation a few specimens were encountered that are worthy of a more detailed discussion. Two of these were found to have been originally recorded from Greenland and from Europe. Specimens were sent to Edwards for an examination and he confirmed the identification. The writer wishes to acknowledge the assistance given to him by Doctor Edwards at this point.

Boletina groenlandica Staeg. Naturh. Tidsskr 1 : 356
(Pl. VI, Fig. 1.)

A specimen of this insect was taken by Dr. C. P. Alexander from Hermit Lake, Mt. Washington, New Hampshire. There is no figure of this species published in America so that a figure of the clasper (fig. 1) is given.

Allodia ornaticollis Meigan. Syst. Bescher 1 : 269.
(Pl. VI, Fig. 2.)

This is the first record of the capture of this European species in America. Since there is no figure published in

this country of this species, the hypopygium (fig. 2) is pictured. Taken in Ithaca, N. Y. Nov. 1934.

Exechia aviculata sp. n. (Pl. VI, Fig. 3.)

Male. Length 4 mm. Head brown, palpi and antennæ light brown, basal two joints of antennæ yellowish. Thorax brown, humeri not tinged with yellow. Abdomen brown, the last three segments somewhat darker. Coxæ and femora with a brownish cast, tibia and tarsi yellow. Prothoracic basitarsus about one fourth longer than tibia, tibia swollen at the apex. Hypopygium (fig. 3) light brown resembling somewhat that of *Exechia januarii* Lunds. Type locality, Ithaca, New York. Type in my collection, paratype in Cornell University collection.

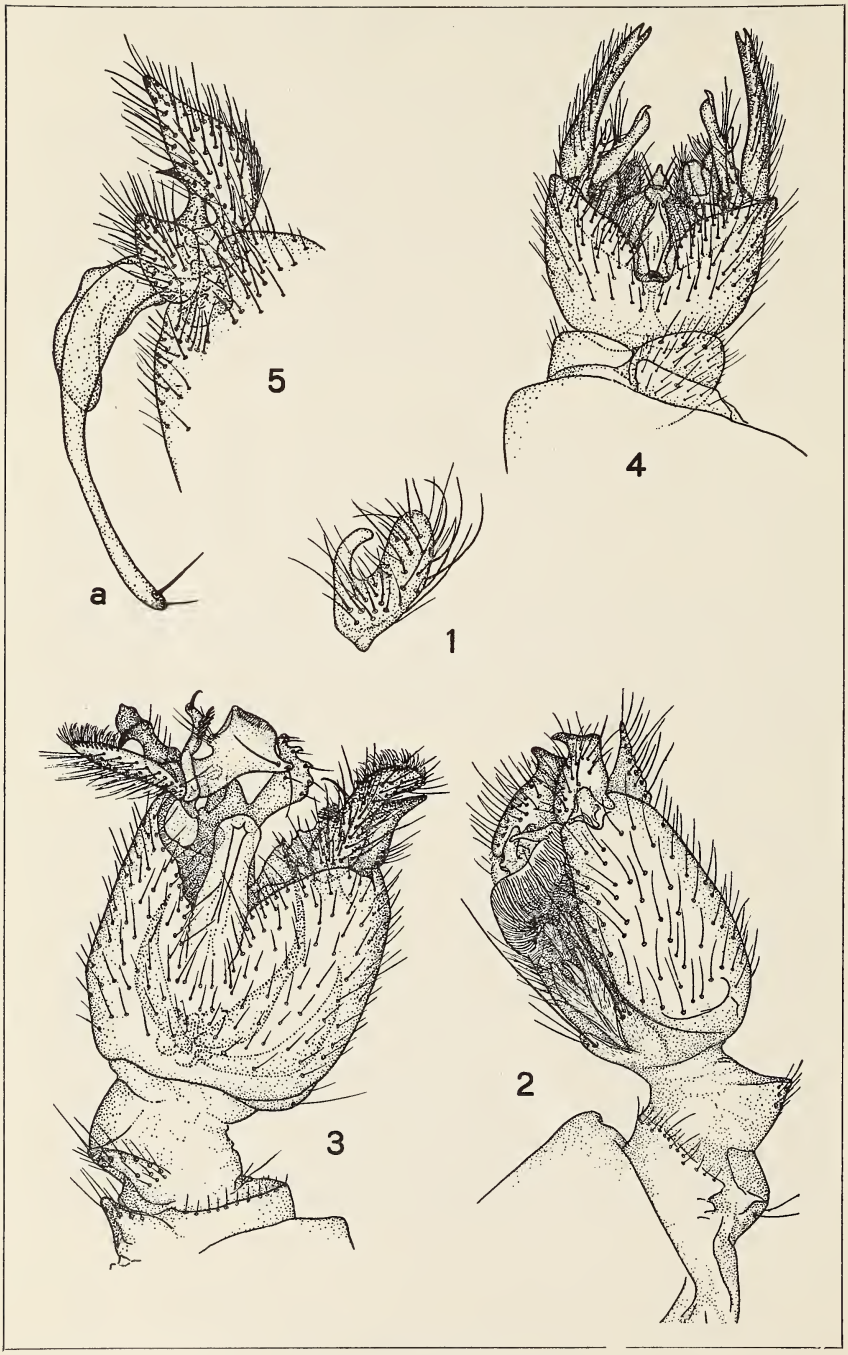
Exechia pollex sp. n. (Pl. VI, Fig. 4.)

Male. Length 3.5 mm. Head dark brown, palpi and antennæ brown, basal two segments of the antennæ light. Thorax dark brown, humeri with a light yellowish tinge. Abdomen concolorous, dark brown. Coxæ and femora yellow, tibia and tarsi somewhat darker. Prothoracic basitarsus and tibia subequal in length. Hypopygium (fig. 4) resembles that of *Exechia frigida* but differs in the details of the claspers. Type locality, Ithaca, New York. Type in my collection.

Rhymosia triangularis sp. n. (Pl. VI. Fig. 5.)

Male and female. Length 4-4½ mm . Head pale brown, palpi and basal two joints of antennæ yellow, remainder of antennæ brown. Mesonotum brown, lateral margins somewhat lighter. Coxæ and femora yellow, femora slightly darkened at apices. Tibia and tarsi brownish yellow. Prothoracic basitarsus about a third longer than the tibia. Dorsum of first and sixth abdominal segments brown. The remaining segments with subtriangular brown spots with the apex of each segment as the base of the triangle. Hypopygium (fig. 5) yellow, resembling that of *Rhymosa inflata* but one of the arms of the forceps is much more slender. Type locality, South Bethlehem, New York. Type in my collection, paratype in Cornell University collection.

Psyche, 1935 Vol. 42, Plate VI.



Shaw—Mycetophilidae

Explanation of Plate VI.

Figure 1. Clasper of *Boletina grœnlandica.*
Figure 2. Hypopygium of *Allodia ornaticollis.*
Figure 3. Hypopygium of *Exechia aviculata.*
Figure 4. Hypopygium of *Exechia pollex.*
Figure 5. Lateral view of clasper of *Rhymosia triangularis.* A, arm of clasper.

Drawings made by D. B. Creager.

A NEW NAME FOR LITHOMYRMEX CARP. (HYMENOPTERA)

In my revision of the fossil ants (Bull. Mus. Comp. Zoöl., 70 (1) : p. 36), which was published in January, 1930, I established the myrmicine genus Lithomyrmex for two species, *rugosus* and *striatus*, from the Miocene shales of Florissant, Colorado. Unfortunately, the same generic name was used by Dr. J. Clark a few months earlier for a recent species of ant, *glauerti*, from West Australia (Journ. Roy. Soc. W. Australia, 14: p. 36, 1929). I therefore propose the new name **Eulithomyrmex** for *Lithomyrmex* Carp. (*nec Lithomyrmex* Clark, 1929), to include the two extinct species from the Florissant shales—F. M. Carpenter.

THE LARVA OF ALLOMERUS (HYM.: FORMICIDÆ)

By George C. Wheeler

University of North Dakota

That the genus *Allomerus* has received scant attention from myrmecologists might be attributed to its restricted range, the paucity of its species, the small size of the workers and the arboreal nesting habits. Nevertheless, my studies on the larvæ would seem to indicate that these ants merit more extensive investigation.

There are only two species in the genus—*decemarticulatus* Mayr and *octoarticulatus* Mayr. The latter has four varieties. In the *Genera Insectorum* (1922) Emery records the geographic distribution of all forms as "Brésil: Amazonas." *A. o.* var. *demeraræ* W. M. Wheeler (1929), however, occurs in British Guiana. The minute yellow workers and their much larger sexual forms inhabit natural cavities in swellings of plants in tropical rain forests. The most complete account of the habits of *Allomerus* is given by Dr. W. M. Wheeler in the *Transactions of the Fourth International Congress of Entomology* (1929, p. 343).

The larvæ of *Allomerus* unique in two characteristics —body hairs and sexual differentiation. The flattened, angulate body hairs of the worker and young sexual larvæ and the enormous, rigid, serrate ventral hairs of the mature sexual forms are peculiar to this genus. As a rule, the larvæ of the sexual forms of ants are differentiated from those of their workers chiefly by size. In *Allomerus,* however, they differ in size, shape and hairs, and these differences are so great that the two types might be regarded as generically distinct, were it not for the similarity of the heads.

Allomerus octoarticulatus Mayr. var. **demeraræ** W. M. Wheeler.

Young worker larva (Pl. VII, Fig. 2): Similar to mature worker larva but more slender.

MATURE WORKER LARVA (Pl. VII, Fig. 1): Orthocephalic; prothorax forming a short, thick neck perpendicular to the rest of the body, which is subcylindrical; nearly straight, rather stout, and slightly attenuated posteriorly; posterior end round-pointed; anus subterminal. Metamerism indistinct. Spiracles, 10 pairs.

Body-hairs few, uniformly distributed, and arranged (at least on the abdomen) in transverse metameric rows and also (less regularly) in longitudinal rows. They fall into four types: (1) at the posterior end a very few small (about 0.016 mm. long) slender hairs with bifid tips (Pl. VII, Fig. 16); (2) a very few small (about 0.016 mm. long) stout hairs with frayed tips on the ventral surface (Pl. VII, Figs. 13 and 14); (3) a few small (about 0.023 mm. long) slender hairs, which have the distal third serrate and often bent and are found on the prothorax and also near the posterior end (Pl. VII, Fig. 17); (4) short (0.036-0.077 mm. long) highly variable hairs, which are typically rather stout, terete or flattened, sharply angulate at the basal third and again near the distal fifth; the terminal portion is flattened and has serrate tip and margins; this type is mostly confined to the dorsal and lateral surfaces (Pl. VII, Figs. 10-12, 15, and 18-22).

Integument thin, delicate, and (except on the thorax) furnished with minute spinules arranged in short transverse rows.

Head (Pl. VII, Fig. 8) moderately large; broadly subpyriform in dorsal view, with the posterior border broadly rounded; width greatest in front of the antennæ. Hairs of head few, about 0.023 mm. long, angulate or strongly curved just distal to the middle; apical half bearing two or three fine, short branches. Antennæ rather large, with three sensillæ, each bearing a spinule.

Labrum (Pl. VII, Fig. 9) small and short, the breadth being twice the length; three-lobed, the middle lobe somewhat larger and projecting farther forward than the lateral lobes; dorsal surface with a pair of minute hairs near the center and usually a third hair near the middle of one lateral border; each lateral lobe with several sensillæ (each bearing a spinule) along the anterior border; median half of ventral

surface spinulose, the spinules in transverse rows which form a subreticulate pattern; on the ventral surface of each lateral lobe a pair of sensillæ near the center and a cluster of four sensillæ near the anterior border at the junction with the median lobe. *Mandibles* (Pl. VII, Fig. 6) very small and without teeth; base subtriangular; apex slender and bent medially at an angle to the base. *Maxillæ* prominent, fused to the labium; proximal sense-organ (Pl. VII, Fig. 5) a slightly raised cluster of five sensillæ, three of which bear one spinule each; distal sense-organ (Pl. VII, Fig. 4) a short projection with two apical sensillæ, each bearing a spinule. *Labium* prominent, a few fine ridges forming a narrow reticulate pattern posterior to the opening of the sericteries; labial sense-organ a slightly raised cluster of five sensillæ, three of which bear one spinule each. *Hypopharynx* (Pl. VII, Fig. 7) broad and furnished with longitudinal ridges.

Immature Sexual (?) Larva (Pl. VIII, Fig. 6): Differs from the mature worker larva of the same size in being stouter and in having the abdomen enlarged at the middle, so that the dorsal profile is more convex.

Sexual Larva (Pl. VIII, Fig. 4): Voluminous and plump, much larger than the mature worker larva (Pl. VIII, Figs. 7A and B); hypocephalic; bean-shaped, somewhat curved ventrally; dorsal profile strongly convex; ventral profile concave anteriorly, slightly convex posteriorly; diameter greatest at the middle, decreasing slightly towards the ends which are rounded. Anus subterminal, with small lips. Metamerism indistinct. Spiracles, 10 pairs.

Body mostly naked, but with a few hairs of four types, each type restricted to a small area. Type I hairs: Extremely long (0.4-0.6 mm.); base stout, straight, and heavily sclerotized; attenuating rather rapidly to a fine apical portion, which is slightly curved forward; distal ⅔ serrate; restricted to the posterior ¾ of the ventral surface and arranged in 4 longitudinal rows, 5 to 8 in each outer row and 4 to 6 in each inner row (Pl. VIII, Fig. 5). Type II hairs: A few (about 10) moderately long (0.17-0.25 mm.) slender hairs, which have the apical half serrate; these are restricted to a small area at the posterior end and are strongly

curved ventrally (Pl. VIII, Fig. 2). Type III hairs: A single pair of simple, slender, strongly curved hairs about 0.15 mm. long, at the anterior end, one a short distance in front of each mesothoracic spiracle (Pl. VIII, Fig. 1). Type IV hairs: A few very minute (0.009 mm. long), simple, straight, acute hairs on the prothorax around the base of the head (Pl. VIII, Fig. 3).

Head and mouth-parts like those of worker larva.

The above descriptions are based on larvæ from a single nest collected at Kartabo, British Guiana, VII-27-1920. I am indebted to Dr. W. M. Wheeler for the material.

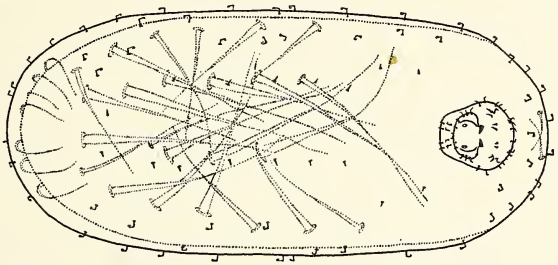
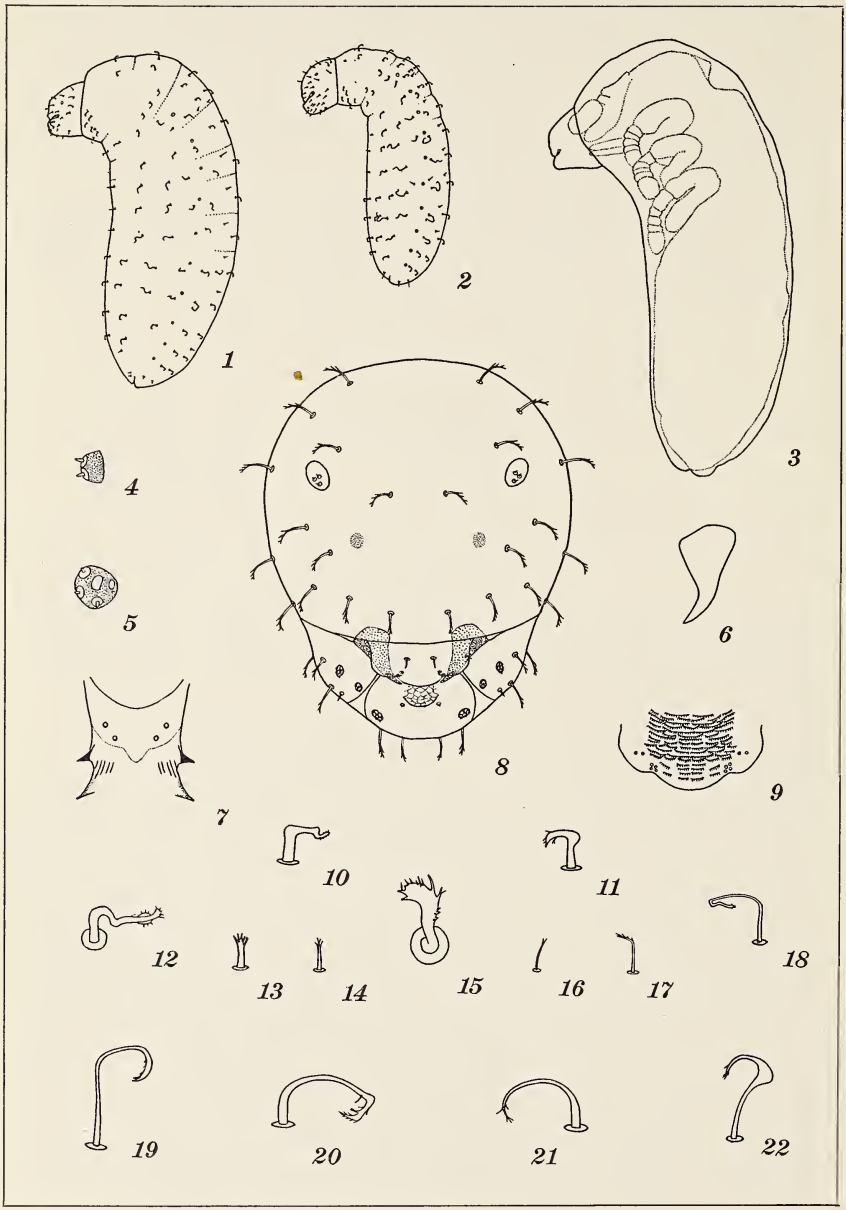


Fig. 1. *Allomerus octoarticulatus* var. *demerarae* W. M. Wheeler. Larva ready to molt to definitive sexual form; the hairs of the latter are easily seen through the transparent integument of the younger form. Ventral view. X50.

As mentioned previously the mature larvæ of worker and sexual forms are so very different that they might be regarded at first glance as belonging to different genera. That such is not the case is proved by the fact that the heads of the two types are identical and by the fact that I have found young larvæ of the sexual type still encased in an integument of the worker type (Fig. 1). Moreover, a worker semipupa enclosed in an integument of the worker type (Pl. VII, Fig. 3) shows that worker larvæ do not attain what I have designated as the definitive sexual form before pupating.

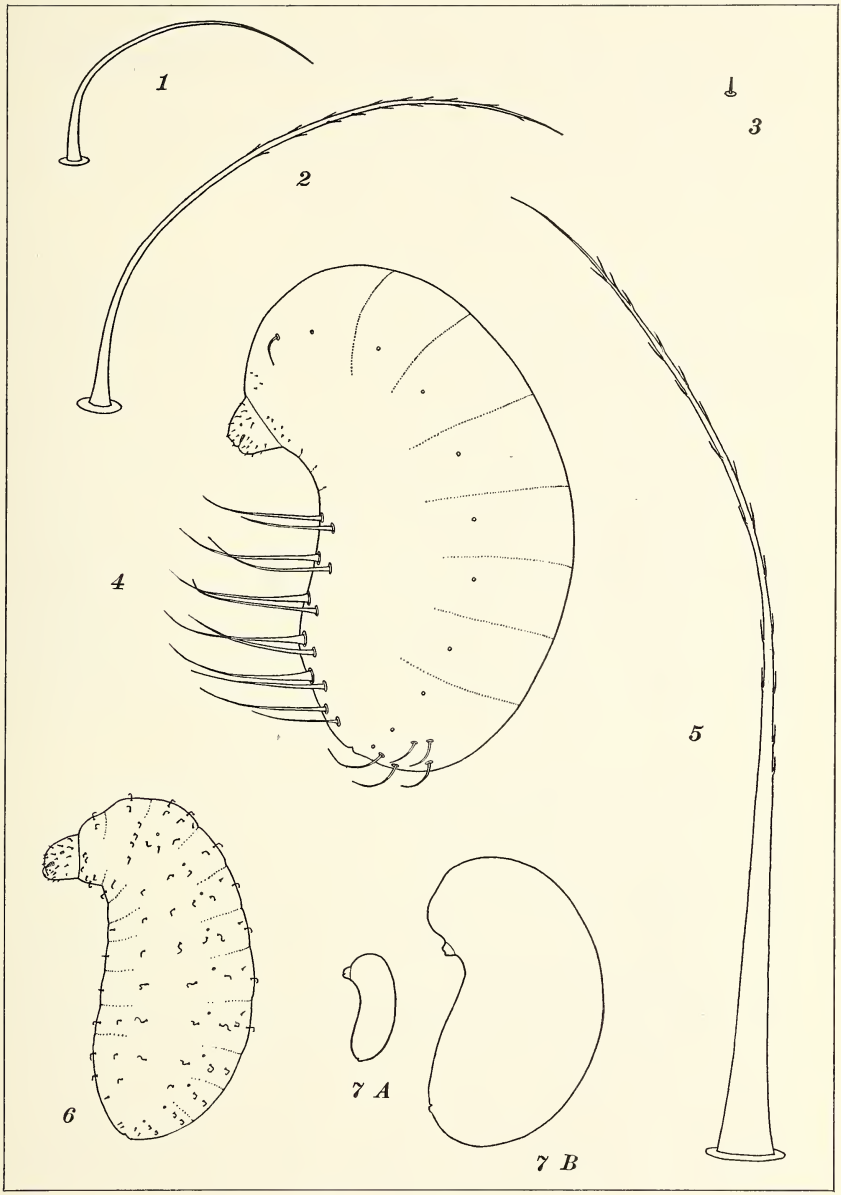
In spite of the fact that all larvæ of *Allomerus* are alike in the early instars, nevertheless, some slight differentiation occurs previous to the molt to the definitive sexual form. Such, at least, is my tentative interpretation of the material studied. The bodies of small (i. e. worker) semipupæ are

Psyche, 1935 Vol. 42, Plate VII.



Wheeler—Allomerus

Psyche, 1935 Vol. 42, Plate VIII.



Wheeler—Allomerus

still as slender and subcylindrical as are those of most of the young larvæ. I have found, however, a few of the size of mature worker larvæ, which differ from the latter only in being stouter, and these I have described above as "immature sexual (?)" forms.

If this tentative conclusion should be substantiated in the future, *Allomerus* larvæ may prove useful in studying the problem of the differentiation of castes.

Explanation of Plates

Plate 7.

Worker larva of *Allomerus octoarticulatus* var. *demeraræ*.

Fig. 1. Mature worker larva, in side view. X34.
Fig. 2. Young larva, side view. X34.
Fig. 3. Semipupa, side view. Hairs omitted. X34.
Fig. 4. Distal maxillary sense-organ, in profile. X550.
Fig. 5. Proximal maxillary sense-organ, surface view. X550.
Fig. 6. Mandible, dorsal view. X275.
Fig. 7. Hypopharynx, dorsal view. X275.
Fig. 8. Head, dorsal view. X190.
Fig. 9. Labrum, ventral view. X275.
Figs. 10-12 and 18-22. Type 4 body-hairs. X275.
Figs. 13 and 14. Type 2 body-hairs. X275.
Fig. 15. Type 4 body-hair, apical aspect. X550.
Fig. 16. Type 1 body-hair. X275.
Fig. 17. Type 3 body-hair. X275.

Plate 8.

Sexual larva of *Allomerus octoarticulatus* var. *demeraræ*.

Fig. 1. Type III body-hair. X275.
Fig. 2. Type II body-hair. X275.
Fig. 3. Type IV body-hair. X275.
Fig. 4. Young (half-grown?) sexual larva, side view. X34.
Fig. 5. Type I body-hair. X275.
Fig. 6. Young sexual larva before molting to definitive sexual form, side view X34.
Fig. 7. Mature sexual larva (*A*) compared in size with mature worker larva (*B*), side view. Outlines only. X10.

SOME MIMETIC FLIES, WITH THE DESCRIPTION OF TWO NEW SPECIES FROM NORTH AMERICA (SYRPHIDÆ; DIPTERA).

By F. M. Hull

University, Miss.

I have recently had occasion to mention the similarity of the lateral aspect of Cerioid flies to that of certain Hymenoptera. Since that time, I find two additional species that prove to be undescribed and are here presented. A Eumenid wasp, *Eumenes bollii* Cress., was discovered among the material from Dilley, Texas, from which *P. reinhardi* Hull was taken and is considered to be probably the "model" of that species. The resemblance, while not exact, is very striking. (Figs. e, f). In at least eight respects, the similarity between them is notable. (1) Position of abdomen; (2) simulation of folded wings; (3) pendulous antennæ; (4) apical segments of antennæ contrastingly colored; (5) pleural markings; (6) general coloration; (7) position of wings; (8) pedicellate abdomen. *C. aldrichi,* n. sp. laterally viewed, greatly resembles *Spilomyia longicornis* Loew.

Cerioides aldrichi n. sp. (Plate 9, fig. 4)

Characterized by fairly large size, yellow scutellum, posteriorly bifid, large yellow spots in anterior corners of second abdominal segment and the prominent silver-tipped style. Not closely related to any North American species. Predominating colors, yellow and black.

Length 17 mm. *Female.* Vertex yellow, the deep black of the upper section of front and of vertex encroaching upon the yellow and dividing it narrowly in the middle . The divided surfaces of the yellow spots rounded. Lower front and entire face, save for a narrow basal margin to the antennifer and a narrow median stripe, shining yellow. Cheeks very broadly, and a slender margin along the front of the epistoma, deep black. The facial stripe is dark brown and has

within itself a slender stripe. Antennifer and antennæ black, the third joint a very deep brown, with a curious lighter brown pubescence. The antennifer is about one third the length of the first antennal joint, and the first joint is a little longer than the second joint. The second and third joints are about equal. The style is long, about two thirds the length of the third joint.

Thorax and pleuræ jet black; a large brilliant pale yellow spot on humeri, a smaller one just before the base of the wing, a spot on mesopleuræ, sternopleuræ, and a short, similarly colored stripe on the dorsum on either side posteriorly. Scutellum shining yellow, sharply margined with black and with a median notch posteriorly. The exceedingly short pile of the scutellum is largely black. Halteres light brown. Squamæ pale yellow.

Abdomen black, the second, third and fourth segments with wide, bright yellow posterior margins, and the last two segments with thick, prominent lunulate pollinose markings. The second segment on either side with an exceedingly large, pale yellow spot. This spot extends toward the middle in its own anterior corner, but is rounded off and does not meet, and the spot is elongated posteriorly in a medial oblique direction almost to the yellow posterior margin of the segment. Thus, the lateral margin of the second segment is black from the posterior corner almost to the anterior corner. Venter black, with prominent yellow cross bands. Legs largely light brownish-yellow, the tibiæ distally and the hind femora on the outer half with a darker brownish area. Coxæ black. Trochanters dark brown. Wings infuscated along the anterior edge, more yellowish on the basal two-thirds of the margin.

One female, Susanville, California (July). W. J. Chamberlin collector. Type in the collection of the author.

A fairly large species not related to any North American form with which I am acquainted. In fact, with the broad abdomen basally, the very short antennifer and large conspicuous yellow spots on the base of the abdomen the species must approach the somewhat generalized hypothetical type described by Shannon (Insecutor Inscitiæ Menstruus, xiii, p. 49). Its short antennifer precludes placing the species in

Tenthredomyia. I do not believe that a subgeneric assignment should be made upon it, lacking a male specimen, and also in view of the fact that there is a slight antennifer, it seems best to consider it as a highly aberrant *Cerioides*.

Tenthredomyia ancoralis Coq.

One male. Las Cruces, New Mexico. July (F. M. Hull) on flowers of privet.

Tenthredomyia abbreviata Loew.

Several specimens, males and females, near Ames, Ia., July 19 (F. M. Hull).

Tenthredomyia tridens Loew.

A large series collected by A. Spuler at Toppenish, Wash., July 22 to August 1.

Tenthredomyia mime n. sp. (Plate 9, fig. 1)

An odd species, of bluish black coloration with ivory white markings. The color, together with the entirely dark wings, with their blue and purple irridescence, makes it a very unique member of the North American *Cerioidini*. It bears a striking resemblance to a bluish-black species of wasp.

Length 15 mm. including antennæ. *Female*. Vertex ivory white, the upper occiput on either side and the front and region about occelli black, the latter with a V-shaped intrusion posteriorly into the white of the vertex. Antennifer, its base, and a short space below broadly extending to the eyes and continued medially as a narrow facial stripe, black. The face with a large, white triangle on either side and a small, white spot on the margin of the eyes just opposite the antennifer together with a pair of similar smaller spots just above the base of the antennifer. The median black stripe of the face is connected with the black oral margin and the cheeks are broadly and entirely black. Antennæ entirely black. The antennifer equal in length to the first and second joints and these latter segments of equal length. The third segment slightly longer than the second. The style quite short.

The thorax entirely black save for a white spot on the humeri, and mesopleuræ, and a smaller one before the base of

the wing and again on the sternopleuræ. The scutellum broadly whitish with a narrow brownish rim posteriorly and anteriorly. Halteres and squamæ light brown.

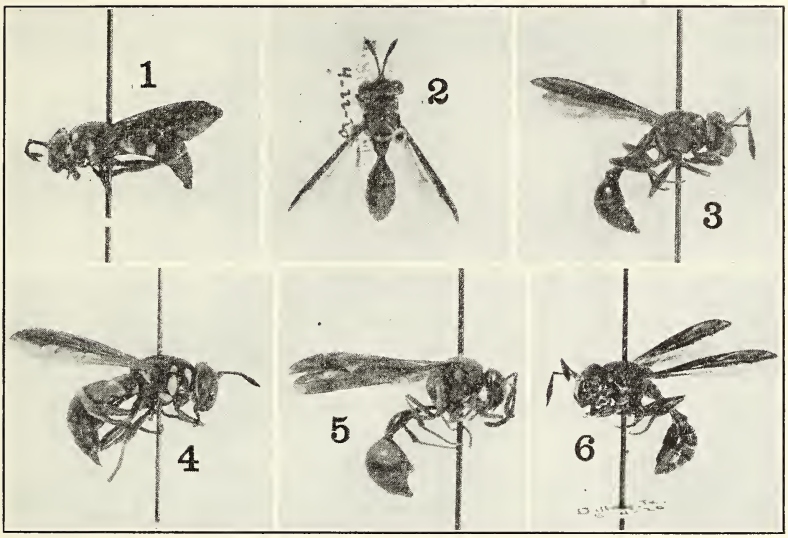
Abdomen black, with a large, oblong white spot in the anterior corners of the second segment, a white posterior margin on the second and third segments, the former noticeably thinned in the middle and wider in the posterior corners. On the posterior margin of the fourth segment there is only a minute median white spot.

Legs black, with the narrow apices of the femora, the basal third of the tibiæ and the hind femora basally, narrowly light-brownish to yellow. Wings entirely dark, with bluish and purplish reflections, the infuscation slightly diluted on the extreme posterior edge.

Type, a female, Tallulah, Louisiana. This remarkable species mimics certain of the bluish wasps. Type in the collection of the author.

Explanation of Plate 9.

Fig. 1. *Tenthredomyia mime* n. sp.
Fig. 2. *Polybiomyia festiva* Hull.
Fig. 3. *Polybiomyia reinhardi* Hull, showing ventral abdominal concavity.
Fig. 4. *Cerioides aldrichi* n. sp.
Fig. 5. A species of wasp, *Eumenes bollii* Cress., which P. *reinhardi* greatly resembles.
Fig. 6. *Polybiomyia reinhardi* Hull, showing pollinose lunulæ of abdomen.



Hull—Mimetic Flies

NEW NEARCTIC MECOPTERA, WITH NOTES ON OTHER SPECIES

By F. M. Carpenter

Museum of Comparative Zoölogy, Harvard University

During the three years subsequent to the publication of my revision of the Nearctic Mecoptera[1], a number of new and interesting species have come to my attention. Some of these were taken by me in the central and western states, but by far the majority were received from other entomologists, as follows: Mr. E. S. Thomas, Ohio State Museum; Mr. C. A. Frost, Framingham, Mass.; Dr. C. B. Philip, Hamilton, Montana; Dr. H. B. Mills, Yellowstone National Park, Wyoming; Mr. E. P. Van Duzee, California Academy of Sciences; Mr. L. C. Lloyd, Seattle, Washington; Dr. H. H. Ross, Illinois State Museum, Urbana, Illinois; Dr. Hugo Kahl, Carnegie Museum, Pittsburg; and Dr. C. E. Mickel, University of Minnesota. To all these I am grateful for their coöperation.

In the present paper I have included the most interesting of the new locality records and descriptions of eight new species. Including the latter, the total number of Nearctic species is sixty-four.

Family Panorpidæ

Brachypanorpa montana Carp.

Bull. Mus. Comp. Zoöl., 72 (6) : 212; 1931.

Four males were taken among pines at Crater Lake, Oregon, July 16, 1932, at an altitude of about 8,000 feet (F. M. Carpenter). As far as I am aware, these are the only specimens in addition to the types which have been collected. No females were found in spite of careful searching.

Panorpa lugubris Swederus

Kgl. Svenska Vetensk.-Akad. Nya Handl., 8:279, 1787.

In the collection of the Illinois State Museum there is a

[1] Bull. Mus. Comp. Zool., 72 (6): 205-277, pls. 1-8, 1931. See also Bull. Brooklyn Ent. Soc. 27: 149-151. 1932.

specimen of this species labeled "N. Mex.". Since *lugubris* has previously been reported only from the Carolinas, Georgia, Florida and Alabama, a New Mexico record is most surprising. Dr. Ross, of the Illinois Museum, assures me, however, that the locality datum is almost certainly correct. If so, this specimen extends by some three hundred miles (to about longitude 103°) the westward range of Panorpa in the Nearctic region, for I have seen no previous records of the genus beyond Austin, Texas (longitude 98°).

Panorpa insolens, n. sp. (Figure 5.)

Body: light reddish-brown. Fore wing: length 12 mm.; width 3 mm., membrane faintly yellow, markings grayish-brown; apical and pterostigmal bands entire; basal band broken at the middle, but very broad, both upper and lower portions fusing with the first basal spot; second basal spot very small; both marginal spots absent; cross veins not margined. ♀ genitalia: internal skeleton small, the axis entirely confined to the plate, not projecting anteriorly as in most species of the genus. Male unknown.

Holotype: Cincinnati, Ohio; May 30, 1908; in Museum of Comparative Zoölogy.

Although in describing this species from the female alone, I have departed from my usual policy of not establishing a new species of Panorpa unless the male is known, I consider the wing markings of this particular insect so unusual that the male when found will at once be recognized. In none of the other Nearctic Mecoptera has the basal band been modified to anything like the form in *insolens*. The internal skeleton is close to that of *P. carolinensis* Banks, and I suspect that the male when found will have a genital structure also close to that of *carolinensis*. In my key to the females of Panorpa (1931, p. 224) insolens runs to section 9, including *signifer, carolinensis* and *longicornis,* from all of which it can be readily separated by the form of the basal band of the fore wing.

Panorpa virginica Banks

Psyche, 13 : 99; 1906.

Two males in the Illinois State Museum are labeled "Wisconsin," the first record of the species in that state.

Panorpa isolata Carp.

Bull. Mus. Comp Zoöl., 72 : 241; 1931.

One male from Waukegan, Illinois, July 7, 1932 (T. H. Frison) is in the Illinois State Museum. Since this species has not previously been found outside of Georgia, the Carolinas and Tennessee, the Illinois record is most interesting and unexpected; it probably signifies that the species occurs in Kentucky and Ohio.

Panorpa speciosa Carp. (Figure 4.).

Bull. Mus. Comp. Zoöl., 72 : 243, 1931.

During the summer of 1934 I was fortunate enough to secure two males and a female of this rare species, which has previously been known only from four males. Both were taken at Vandalia, Illinois, June 28, 1934. The female is similar to the male in coloration and wing markings. The internal skeleton (figure 4) is small but has a very deep "U"-shaped cleft; the axis is small, projecting only a short distance beyond the plate itself; there is a small chitinous envelope covering a part of the axis and surrounding part of the plate. This female, now in the Museum of Comparative Zoölogy, is designated as the allotype.

Panorpa bifida, n. sp. (Figures 1, 3.)

Body brown to yellow; anal horn present. Fore wing: length 11-13 mm.; width, 3-4 mm.; membrane faintly yellow, markings dark-brown or black; apical band entire; pterostigmal band broken at middle; basal band interrupted; first basal and first and second marginal spots present; second basal spot absent; cross veins margined. ♂ genitalia: genital bulb rounded; forceps of moderate size, the distal half quite slender; hypovalves long, extending very nearly to the base of the forceps; ventral valves elaborate, each consisting of a single semi-circular basal piece which forks distally into two long branches; the outer one of these is the longer, is slightly curved, and bears a number of barbs; the inner branch is nearly straight and is also barbed. ♀ genitalia: internal skeleton small; the posterior part of plate in the form of a half-moon; the anterior part with a deep, broad "U"-shaped incision.

Holotype (♂): Rector, Penna., July 18, 1921; in the Carnegie Museum, Pittsburg, Pennsylvania.

Allotype: same locality and date as holotype; in the Carnegie Museum, Pittsburg, Pennsylvania.

Paratypes: 1 ♂, Rector, Pennsylvania, July 31, 1921; 1 ♀, Allegheny Co., Pennsylvania, July; in the Museum of Comparative Zoölogy.

This unusual Panorpa is closest to *anomala* Carp. in both wing markings and genitalia. The male genital bulb of *bifida,* however, has longer forceps and hypovalvæ, and the shape and lengths of the ventral valves are very different. The internal skeleton of the female genitalia has a much broader incision posteriorly than that of *anomala.* In my key to the males of Nearctic Mecoptera (Bull. Mus. Comp. Zoöl., 72 (6), 1931) *bifida* runs to the couplet containing *dissimilis* and *decorata* (28), from both of which it can readily be separated by the forked ventral valves. The female runs to the last group of species under number 22 and can be distinguished from the species included there only by the structure of the internal skeleton.

Panorpa flexa, n. sp. (Figure 2.)

Head, thorax and first 6 segments of abdomen dark-brown, nearly black; abdominal segments 7-9 yellowish-brown; anal horn absent. Fore wing: length, 11 mm. width, 3 mm.; membrane colorless, markings light brown, all bands interrupted; both marginal and both basal spots absent, cross veins margined. ♂ genitalia: genital bulb rather slender, forceps of moderate size, without lobes; a cluster of heavy, black hairs at base of forceps; hypovalves long, almost reaching to the base of the forceps; ventral valves consisting of a long, cylindrical, glaborous shaft, smoothly curved; at the base of this shaft is a cluster of 5 radiating barbs; an abruptly tapered point terminates the shaft itself. Female unknown.

Holotype (♂): Indian Pass, Smoky Mts., N. Carolina; September 4, 1933 (C. F. Walker); in the Museum of Comparative Zoölogy.

This locality is almost identical with that at which the types of *P. longicornis* and many other Panorpas were col-

lected by the writer at the same season three years previous. Although no specimens of *flexa* were among the several hundred Panorpas which were secured at that time, the specimen described was the only Panorpa which Mr. Walker collected in the vicinity.

Since *flexa* does not possess the anal horn, it falls into the *nebulosa* group of Panorpa, and in my key (1931, p. 222) runs to couplet 7. As this couplet reads, *flexa* will not be covered by either choice; but if the first line of the couplet be changed to "ventral valves curved," both *flexa* and *sigmoides* will be included. From *sigmoides* the new species can be distinguished by the shape of the ventral valves, which are sigmoidally curved in *sigmoides* but nearly semicircular in *flexa*.

Panorpa latipennis Hine

Bull. Sci. Lab., Den. Univ., 11 : 248, 1901.

Two females received from E. S. Thomas, of the Ohio State Museum, were collected in Ohio: Fallsburg, June 18, 1932 (C. F. Walker), and Bay Point, Ottawa County, July 18, 1931. These are the first records in the state and bear out my previous suggestion (1932) that *latipennis* probably occurred in Ohio and Pennsylvania.

Panorpa submaculosa Carp.

Bull. Mus. Comp. Zoöl., 72 (6) : 255; 1931.

One female was taken by C. E. Mickel in Prince George Co., Maryland, July 27, 1929; this constitutes the first record for the state.

Family Bittacidæ

Bittacus punctiger Westwood

Trans. Ent. Soc. Lon., 4:195; 1841.

One male, now in the Museum of Comparative Zoölogy, was collected at Dunedin, Florida, during March (Blatchley) ; this constitutes the first record in that state, although the species has previously turned up in neighboring states.

Family Boreidæ

During the past two years several extensive collections of Boreus, mostly from western states, have been received for

determination. One very unusual species (*reductus*) from this lot has already been described[2]. Quite recently, also, Mr. L. C. Lloyd has described[3] another species (*intermedius*) from Alaska, and recorded the occurrence of *B. unicolor* at the same locality. Through the courtesy of Mr. Lloyd and the authorities of the Washington State Museum, these specimens were sent to me for examination. Much to my surprise, a study of all the Boreus material now at hand reveals that among the recently collected Western material there are no less than five undescribed species, making a total of twelve species of the genus now known from the Nearctic region.

These additional species have brought to light several new characteristics which are most useful in the taxonomy of at least the Nearctic members of Boreus. The most important of these is the form of the hypandrium (tenth sternite), which may be either narrowly or broadly triangular, and may be either emarginate (notched) or entire (straight). Since the shape of the hypandrium is very helpful in the identification of the new species described below, I have also included here figures or descriptions of other Nearctic species of the genus. Some of the new species are also characterized by the color and length of the pubescence, features which show very little difference among the previously described ones. The lengths of the rostrum and ovipositor are likewise convenient diagnostic characteristics, but I have found it advisable to measure these at somewhat different positions from formerly. In the present descriptions the rostrum is measured from the ventral edge of the eye, and the ovipositor from the posterior margin of the ninth tergite[4]. This gives a slightly smaller dimension for the length of the ovipositor than when it is measured from the corresponding sternite, but the measurement is more easily obtained since the specimens are usually glued to points and the ventral surface of the head thus concealed. The detailed coloring of the various parts of the body, as I have already pointed

[2] Can. Ent., **65**: 94-95. 1932.
[3] Pan. Pacific Ent., **10**: 119-120. 1934.
[4] the *ninth* tergite because the tenth is modified to form a long sheath covering the ovipositor proper.

out, is of little taxonomic value, because it is subject to much individual variation.

Since there are now more than twice as many species of Boreus as were known when my key was published (1931), new keys to both sexes are included here.

Key to Males of Boreus

1. Hypandrium entire ..... 2.
   Hypandrium emarginate ..... 8.
2. Wings and all of body black ..... 3.
   Wings brown or yellow ..... 4.
3. Body covered with long, white pilosity; hypandrium slenderly triangular ..... *reductus* Carp.
   Body covered with very fine, white pubescence, hypandrium broadly triangular ..... *unicolor* Hine.
4. Fore wings *gradually* tapering throughout their entire lengths ..... 5.
   Fore wings strongly narrowed in proximal half ..... 6.
5. Fore wings very broad and long, two and one-half times the length of the rostrum (British Columbia) ..... *elegans* n. sp.
   Fore wings not so broad and of moderate length, only one and one-half times the length of the beak (eastern United States) ..... *nivoriundus* Fitch.
6. Distal half of wings very slender; rostrum twice the length of the eye ..... *intermedius* Lloyd.
   Distal half of wing normally slender; rostrum only one and one-half times the length of the eye ..... 7.
7. Body except wings black or nearly so ..... 8.
   Body brown or reddish brown ..... *californicus* var. *californicus* Packard.
8. Wings yellow-brown ..... *borealis* Banks.
   Wings dark brown ..... *californicus* var. *fuscus* n. var.
9. Body covered with long white or yellowish pilosity ..... 10.
   Body covered with very fine white pilosity ..... 11.
10. Wings and body deep black ..... *nix* n. sp.
    Wings yellow or light brown, body dark brown ..... *pilosus* n. sp.
11. Wings yellowish-brown, much lighter than the dark brown body ..... *isolatus* n. sp.

Wings either black or brown, always the same color as the body ..... *brumalis* Fitch.

Key to Females of Boreus

1. Fore wing reduced to a minute scar, similar to that of the hind wing ..... *reductus* Carp.
   Fore wing in the form of a small oval pad ..... 2.
2. Wings and body the same color (brown or black) ..... 3.
   Wings much lighter (yellow or yellow-brown) than body (dark brown or black) ..... 7.
3. Ovipositor short, only as long as rostrum ..... 4.
   Ovipositor distinctly longer than rostrum ..... 5.
4. Body either black or very dark brown ..... *brumalis* Fitch.
   Body light brown or medium brown ..... *nivoriundus* Fitch.
5. Body covered with long, white or yellowish hairs ..... *nix* n. sp.
   Body covered with fine, white pubescence ..... 6.
6. Ovipositer twice as long as rostrum ..... *unicolor* Hine.
   Ovipositer only one and one-half times as long as rostrum ..... *gracilis* n. sp.
7. Ovipositer twice the length of the rostrum ..... *intermedius* Lloyd.
   Ovipositer at most one and one-half times as long as the rostrum ..... 8.
8. Body light brown or reddish brown ..... *californicus* var. *californicus* Packard.
   Body black or nearly so ..... 9.
9. Body black, with a pronounced bronze hue; abdomen above exceedingly shiny ..... *borealis* Banks.
   Body jet black; abdomen above with only a slight shine ..... *californicus fuscus*, n. var.

Boreus brumalis Fitch

Amer. Journ. Agric., 5 : 278; 1847.

Although this species has previously been known to occur only in Massachusetts, New York, District of Columbia and Michigan (Detroit), a great many specimens have been taken in Hocking and Fairfield Counties, Ohio, December 5-25, 1933 (E. S. Thomas, J. S. Thomas, W. Goslin, R. Goslin). These Ohio specimens, although somewhat smaller and more

uniformly black than the New England specimens, show no structural differences whatever. The posterior margin of the hypandrium is emarginate, the hypandium as a whole being shaped much like that of *isolatus,* n. sp. (figure 11). The body of *brumalis* is covered with a prominent yellow pubescence, which is more striking in the black specimens than in the brown ones.

Boreus nivoriundus Fitch

Amer. Journ. Agric., 5 : 277; 1847.

This is another species which, previously known only from New England and northern New York, has been found in Hocking and Fairfield Counties by the above-named collectors (December 5-25, 1934). The Ohio specimens, like those of *brumalis*, are very much smaller than the more eastern ones, being about one-half the length of the latter. In all other respects, however, the Ohio specimens and the New England ones are identical. The fact that the more southern specimens of both *brumalis* and *nivoriundus* are decidedly smaller than the northern ones suggests that the more moderate climatic conditions tend to cause smaller specimens in this particular genus of insects, which are of course only active in the adult stages from November to February.

The hypandrium of *nivoriundus* is entire and shaped very much like that of *unicolor* (figure 15). The color of the body is subject to some variation, the New England specimens being light brown and the Ohio ones somewhat darker, but the color never reaches the blackish brown of *brumalis.*

Boreus unicolor Hine (Figure 15.)

Bull. Sci. Lab. Den. Univ., 11:250; 1901.

This insect has previously been recorded only from Bozeman, Montana, and Reno, Nevada (6,600 ft.). In the collections sent by Dr. Philip and Dr. H. B. Mills there are 15 specimens of both sexes from Blacktail Flat and Specimen Ridge, Yellowstone National Park, Wyoming, March 17, 1934 and Feb. 5, 1935; and several specimens from Gird's Creek, Ravalli County, Montana, November 2 and December 30, 1934 (N. L. Jellison). Mr. Lloyd (1934) recorded this species from Alaska also, but his specimens really belong to a new species (*gracilis*) described below.

The hypandrium is entire and broadly triangular in outline (figure 15). The body is covered with a very short pubescence; the beak is short, about one and one-half times as long as the eye, and only half as long as the ovipositor.

Boreus nix n. sp. (Figure 7.)

Male: length of body, 3 mm.; uniformly black except the eyes, which are either black or dark brown or both; entire body including wings covered with long, white pilosity, except pronotum, which bears two rows of very long heavy black hairs, one row along the anterior margin, the other along the posterior margin; wings with the outer margin smoothly curved, as in *unicolor* (see Carpenter, 1931, fig. 6d); hypandrium broadly triangular, deeply emarginate (figure 7); rostrum short, less than one and one-half times the length of the eye.

Female: length, 4 mm.; entire body, including wings, black and covered with long white pilosity; ovipositor one and one-half times the length of the rostrum; fore wing covering entire hind wing scar.

Holotype (♂) and allotype: Gird's Creek, Ravalli County, Montana, November 2, 1934, on snow (W. L. Jellison); both in Museum of Comparative Zoölogy.

Paratypes: 1 ♂ with same collecting data as holotype; 2 ♂, 2 ♀, Hamilton Heights, Ravalli County, Montana, November 15, 1931, on snow (C. B. Philip); all in writer's collection; 1 ♀ Hamilton Heights, Ravalli County, Montana, November 15, 1931, in collection of the California Academy of Sciences.

This interesting species is easily recognized by the combination of the black wings, emarginate hypandrium, and long, white pilosity. The latter is visible without magnification and gives the insect a fuzzy appearance.

Boreus pilosus n. sp. (Figure 10.)

Male: length, 3 mm.; wings light brown, genital claws and hypandrium brown, legs light brown or dark brown; eyes dark brown or black; rest of body black; entire body covered with long, yellowish-white pilosity, especially well developed on the abdominal terga; pronotum with two rows

of very long, heavy, yellow-brown hairs; hypandrium emarginate, the notch broadly "V"-shaped; rostrum long, more than twice as long as the eye.

Female: length, 4.5-5 mm.; wings, ovipositor and legs light brown or yellow-brown; eyes dark brown or black, pronotum reddish brown; rest of body black; entire body covered with prominent yellow pilosity, which is especially long and deeply colored on abdominal terga; pronotum with the two rows of long yellow-brown hairs as in male; ovipositor short, only a little longer than the rostrum; fore wing covering hind wing scar.

Holotype (♂) and allotype: Kaslo, British Columbia, December, 1932; both in Museum of Comparative Zoölogy.

Paratypes: 2 males, 8 females, all with same collecting data as holotype in Museum of Comparative Zoölogy; and 1 female from the same lot in the California Academy of Sciences.

Boreus isolatus n. sp. (Figure 11.)

Male: length, 3.2 mm.; wings light brown, eyes brown, legs dark brown with the joints black; rest of body black; most of body covered with very fine, short, white pilosity, uniform over most of body, absent only on the anterior half of each abdominal tergum; hypandrium rather narrow, and emarginate, the notch being in the form of a "V"; rostrum short, scarcely longer than the eye. Female unknown.

Holotype (♂): Como Lake, Ravalli County, Montana, January 6, 1935 (W. L. Jellison); in Museum of Comparative Zoölogy.

Although somewhat hesitant to describe this species from the single male at hand, I believe that the characteristics of the male are so distinctive that it unquestionably represents an easily recognized species. It is the only one of the western species of Boreus which has the combination of the emarginate hypandrium and short pilosity, the other species with the emarginate hypandrium (*pilosus* and *nix*) having long pilosity over the entire body, and especially on the abdominal terga.

Boreus intermedius Lloyd

Pan. Pacific Ent., 10:119-120; 1934.

Male: length, 3.5 mm.; wings and legs yellow or yellow-brown, hypandrium and genitalia yellow and brown, eyes grayish brown, mottled with black, rest of body dark bronze, almost black; entire body covered with fine, short pubescence, nearly absent on abdominal terga; wings abruptly narrowed near the middle, as in *californicus*, but with the distal half much more slender than in that species; hypandrium entire, narrowly triangular; rostrum twice as long as the eye.

Female: wings yellow, legs yellow-brown, ovipositor brown and dark brown, eyes grayish brown; rest of body dark bronze; entire body covered with fine, short, white pilosity nearly absent on abdominal terga; fore wing completely covering hind wing scar; ovipositer scarcely (if at all) longer than the rostrum.

Holotype (♂) and allotype: collected between Kennecott and McCarthy, Alaska, April 15, 1934; on snow; both in Washington State Museum[5].

The male of this species resembles closely that of *californicus*, but differs in having the distal half of the wings much more slender than in that species. The female, also, approaches that of *californicus* but can be distinguished by the much shorter ovipositer.

Boreus borealis Banks. (Figure 14.)

N. Amer. Fauna, Bur. Biol. Surv., U.S.D.A., 46:158; 1923.

Male: length 4 mm.; wings yellow-brown; hypandrium and legs light brown and brown; eyes brown; rest of body black; with a pronounced bronze hue; abdomen above extremely shiny; short, white pilosity sparsely distributed over body, reduced on terga; pronotum without long spines; wings strongly narrowed in the proximal half; hypandrium entire; rostrum one and one-half times the length of the eye.

[5]After this paper had been sent to the press a pair of *intermedius* were forwarded to me by Mr. Lloyd; both were collected at the type locality (April 29, 1935) and have been deposited in the Museum of Comparative Zoölogy.

Female: length, 5 mm.; color as in male; pilosity sparse, especially on abdomen; wing pads yellow, covering hind wing scars; ovipositer one and one-half times the length of the beak.

This rare species, of which only four specimens are known, has not been collected outside of the type locality, St. Paul Island, Bering Straits, Alaska. It closely resembles the *fuscus* var. of *californicus,* but differs in the bronze coloration and the brilliant shine of the abdomen.

Boreus californicus Packard. (Figure 13.)

Proc. Bost. Soc. Nat. Hist., 8:408; 1871.

Male: length 3.5-4 mm.; wings light yellow to light brown; eyes gray, rest of body brown, usually more or less bronze in color; body covered with fine, short, white pubescence, nearly absent from abdominal terga; fore wings abruptly narrowed at about the middle; hypandrium entire, broadly triangular; rostrum one and one-half times as long as the eye.

Female: length 5 mm.; color similar to that of the male, wing pads yellow to light brown; fine, short, white pilosity covering body, but much reduced on abdominal terga; ovipositor one and one-half times as long as the rostrum; fore wing pads covering hind scar.

A study of the specimens of *californicus* now at hand shows that there is much variation in the coloration of these insects, some having the body definitely brown and the wings yellow; others, the body black and the wings brown. The type specimens, all from Ft. Bidwell, Siskiyou County, California, are of the former class, with brown bodies and yellow wings in both sexes. A series of 7 specimens from Goose Lake, Siskiyou County, are somewhat similar, though the bodies are a dark brown and the wings a light brown. These seem to me to represent the typical *californicus.* The darker specimens have been found only in more northern regions (British Columbia, Alberta and Montana) and appear to me to deserve a varietal rank, designated here as *fuscus.*

Boreus californicus var. **fuscus** n. var.

Male: length, 3 mm.; wings and legs brown or even dark

brown; eyes gray-brown; rest of body black; body covered with a fine, short, white pilosity, much reduced on abdominal terga; wings and hypandrium shaped as in typical *californicus;* rostrum one and one-half times as long as the eye.

Female: length, 4 mm.; wings and legs light brown, eyes gray-brown; rest of body black; fine, white pilosity over body as in male; ovipositer one and one-half times as long as rostrum; fore wing pad covering hind wing scar.

Holotype (♂) and allotype of var. *fuscus*: Kaslo, British Columbia, January 3, 1908; in the Museum of Comparative Zoölogy.

Paratypes: 1 ♂, Gird's Creek, Ravalli County, Montana, November 4, 1934 (W. L. Jellison); 3 ♂, 7 ♀, same data, November 2, 1934 (W. L. Jellison); 2 ♀, 2 ♂, Kaslo, B. C., January 3, 1908; 4 ♀, 1 ♂, Terrace, B. C.; 1 ♂, Sulphur Mt., Alberta, February 10; all in writer's collection.

Boreus gracilis n. sp.

Female: length, 5 mm.; wings, legs, ovipositor very dark brown, almost black; eyes and rest of body black; white pilosity on body somewhat longer than that of *californicus,* but nearly absent on abdominal terga; pronotum with two rows of long, heavy, black spines; rostrum twice the length of the eye; ovipositor one and one-half times the length of the rostrum; fore wing pads small, not entirely covering the hind wing scar, the posterior half of which is visible from above. Male unknown.

Holotype (♀): collected between Kennecott and McCarthy, Alaska, April 15, 1934 (W. L. Lloyd); in Washington State Museum.

Paratype: 1 ♀, with same locality data as holotype; in Museum of Comparative Zoölogy.

The specimens on which this species is based were determined by Lloyd (1934) as *unicolor* Hine. They are excluded from this species, however, by the difference in the lengths of the rostrum and the ovipositor, as well as by the partially reduced fore wing pads, a characteristic which is not shared by any other of our Boreus.

Boreus reductus Carp. (Figure 9.)

Can. Ent., **65**:94-95; fig. 1; 1932.

This species has previously been known only from the five

types, collected at Kaslo and Lillooet, B. C. Five additional specimens, three males and two females, are present in the material sent to me by Dr. Philip. All were taken in Ravalli County, Montana, two at Gird's Creek (Nov. 2, 1934) and the others at Como Lake (Jan. 6, 1935) by W. L. Jellison. Since the Montana locality is almost two hundred and fifty miles south of Kaslo, the range of the species is extended considerably by the new material. These specimens have also enabled us to make a better diagnosis of the species than was possible with the type material alone. The females, of course, are readily distinguished by the complete loss of the fore wing pads. Both males and females are covered with a long, white pilosity, longer than that of any of the other species of Boreus except two of the species described above (*nix* and *pilosus*). The hypandrium of the male (figure 9) is long and slender, the sides in the distal half being nearly parallel.

Boreus elegans n. sp. (Figures 8, 12.)

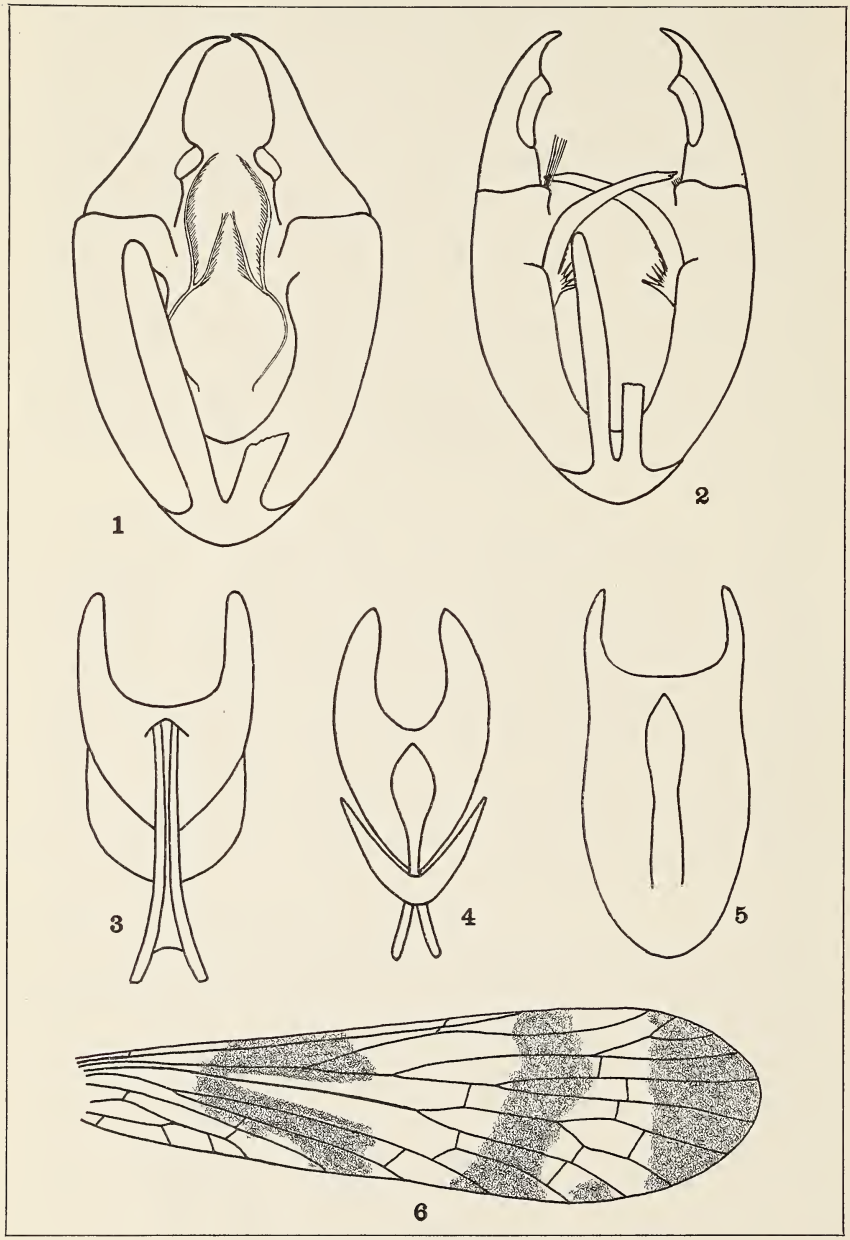
Male: length, 3.5-3.8 mm.; wings and legs light brown, almost yellow; hypandrium, rostrum and pronotum reddish brown; eyes dark red; head and abdomen dark reddish brown; fine, white pilosity over body, well developed on the abdominal terga; pronotum with two rows of long, black spines; fore wings long and very broad, two and one-half times as long as the rostrum and broader than in any other species of the genus, the outer margins almost straight; hypandrium entire, narrowly triangular; rostrum not quite one and one-half times the length of the eyes. Female unknown.

Holotype (♂): Vancouver, B. C., Dec. 1930 (H. E. Hinton); in California Academy of Sciences.

Paratype: 1 ♂ with same locality data as the holotype; in Museum of Comparative Zoölogy.

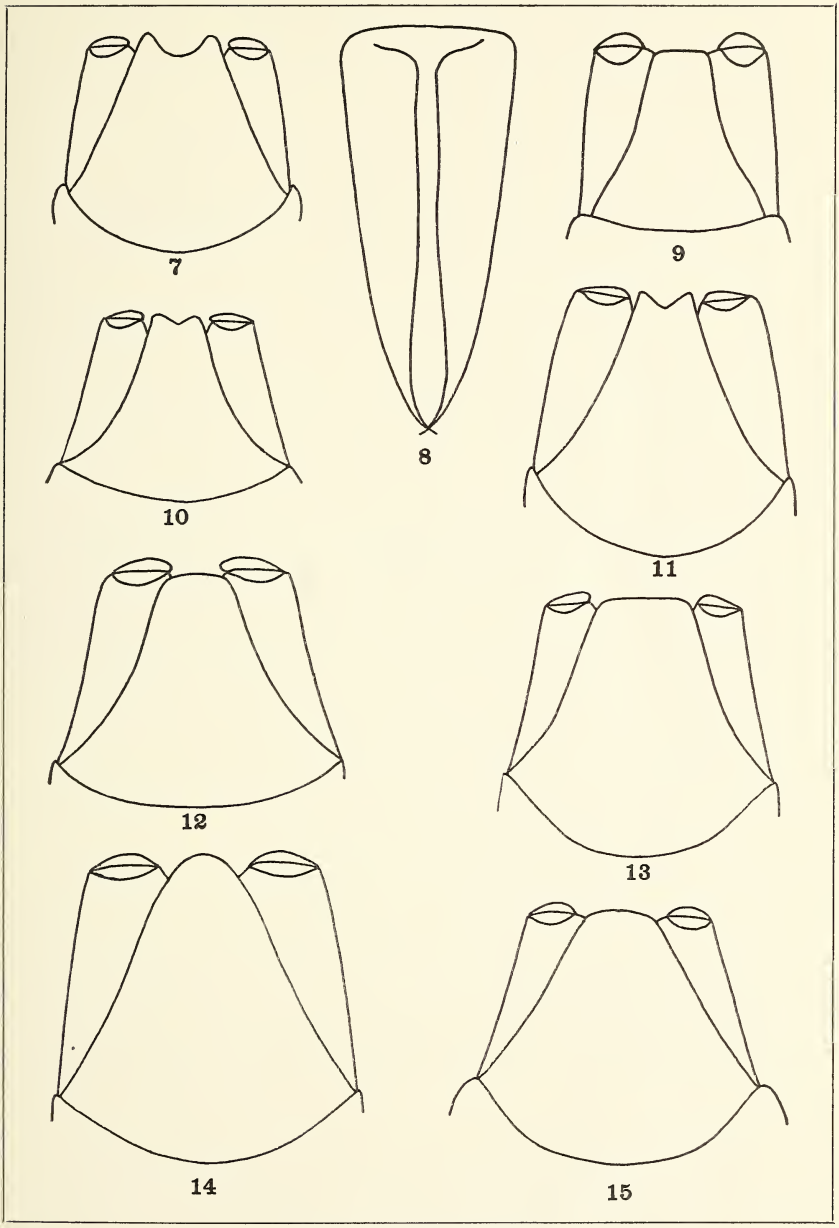
This is the most striking of the Nearctic species of Boreus; it is the only one of our species with a dominant reddish coloration. The wings are much like those of the eastern *nivoriundus*, the outer margins being quite straight, but they are much longer, being two and one-half times the

Psyche, 1935 Vol. 42, Plate X.



Carpenter—Mecoptera

Psyche, 1935 Vol. 42, Plate XI.



Carpenter—Mecoptera

length of the rostrum as compared with one and one-half times in *nivoriundus*.

Explanation of Plates.

Plate 10.

Fig. 1. *Panorpa bifida*, n. sp., ♂ genital bulb of holotype.
Fig. 2. *Panorpa flexa*, n. sp., ♂ genital bulb of holotype.
Fig. 3. *Panorpa bifida*, n. sp., internal skeleton of ♀ allotype.
Fig. 4. *Panorpa speciosa* Carp., internal skeleton of ♀ allotype.
Fig. 5. *Panorpa insolens*, n. sp., internal skeleton of ♀ holotype.
Fig. 6. *Panorpa insolens*, n. sp., fore wing of holotype.

Plate 11.

Fig. 7. *Boreus nix*, n. sp., hypandrium of ♂ holotype.
Fig. 8. *Boreus elegans*, n. sp., wings of ♂ holotype.
Fig. 9. *Boreus reductus* Carp., hypandrium of ♂.
Fig. 10. *Boreus pilosus*, n. sp., hypandrium of ♂ holotype.
Fig. 11. *Boreus isolatus*, n. sp., hypandrium of ♂ holotype.
Fig. 12. *Boreus elegans*, n. sp., hypandrium of ♂ holotype.
Fig. 13. *Boreus californicus* Packard, hypandrium of ♂.
Fig. 14. *Boreue borealis* Banks, hypandrium of ♂ cotype.
Fig. 15. *Boreus unicolor* Hine, hypandrium of ♂.

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ORIENTAL NEMESTRINIDÆ

By Joseph C. Bequaert

Museum of Comparative Zoölogy,
Harvard University, Cambridge, Massachusetts

I have recently been privileged to study an interesting lot of Nemestrinidæ obtained by Mr. Vitalis de Salvaza in Laos and Cochinchina, comprising four species, two of which appear undescribed. An additional species new to Science was obtained by Prof. T. D. A. Cockerell in Siam.

The Oriental and Indo-Malayan Region proper (excluding New Guinea) is poor in Nemestrinidæ, a peculiarity which it shares with the other truly tropical parts of the World. The subfamily Nemestrininæ is not represented, the two old records of *Nemestrina pallipes* Olivier (1810, Nouv. Bull. Sci. Soc. Philom. Paris, II, p. 94) and *Nemestrina javana* Macquart (1840, Dipt. Exot., II, pt. 1, p. 17), supposedly from Java, being obviously erroneous. The subfamily Hirmoneurinæ comprises thirteen Oriental species, all of the genus *Hirmoneura,* and the subfamily Trichopsideinæ, seven species of four genera, *Atriadops, Nycterimyia, Nycterimorpha* and *Ceyloniola.*

The latest revision of Oriental Nemestrinidæ is by E. Brunetti in the Fauna of British India (1920, Diptera Brachycera, I, pp. 144-156).

Subfamily Hirmoneurinæ

Hirmoneura Meigen, 1820

Key to Subgenera

1. Three submarginal cells present (second longitudinal vein and upper branch of third connected by a cross-vein). Alula well developed.....2.

Two submarginal cells only (the first and second fused). No accessory cross-veins in any of the posterior cells ..... 4.

2. First and second posterior cells normally not divided by cross-veins. Eyes densely pubescent, holoptic in both sexes (or at least in the male) ..... *Hyrmophlæba.*
   First or second posterior cells, or both, subdivided by an accessory cross-vein, sometimes producing a second, incomplete diagonal vein in the apical third of the wing ..... 3.
3. Eyes densely pubescent, holoptic in both sexes (or at least in the male) ..... *Austrohirmoneura.*
   Eyes bare, distinctly separated on the frons (in which sex?) ..... *Hirmoneurites.*
4. Alula much narrowed, especially basally. Eyes bare, distinctly separated by the frons in the female; (male unknown) ..... *Indohirmoneura.*
   Alula well developed ..... 5.
5. Eyes holoptic in both sexes or in the male only ..... 6.
   Eyes always distinctly separated by the frons in both sexes ..... 7.
6. Eyes very densely pubescent ..... *Hirmoneurilla.*
   Eyes either completely bare or with a few, scattered, miscroscopic hairs ..... *Hirmoneuropsis.*
7. Eyes densely pubescent ..... *Hirmoneura*, proper.
   Eyes bare ..... *Neohirmoneura.*

Of the eight subgenera in which I have divided the genus, all but two are represented in the Oriental Region. *Austrohirmoneura* is restricted to Chile and *Hirmoneurites* is known in the fossil state only.

Subgenus **Hirmoneura,** proper

Key to Species

1. Ground color of legs, antennæ and palpi black. Large species, 15 to 16 mm. long ..... 2.
   Ground color of legs, including femora, bright yellowish-red or ferruginous ..... 3.
2. Body rather uniformly covered with thin, soft, gray pubescence, with an admixture of yellowish hairs on the abdomen. Eyes covered with dark brown pile.. *H. opaca* Lichtwardt.

Abdomen with a broad basal band of pale pubescence, contrasting with the black pilosity of the remainder of the abdomen. Eyes covered with yellowish pile.. *H. cockerelli* J. Bequaert.

3. Small, gray species, 11 to 12 mm. long, with abdominal transverse bands of yellowish and brown pubescence. Antennæ and palpi yellowish-red..... *H. cingulata* Lichtwardt.

Larger species, 16 to 20 mm. long; abdomen mostly covered with pale yellowish-rufous pubescence, close to the base with a narrow, transverse band of black hairs. Antennæ and palpi black..... *H. austeni* Lichtwardt.

Hirmoneura (Hirmoneura) cingulata Lichtwardt

Hirmoneura cingulata Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 644 (♀; India, without more definite locality); 1913, Rec. Indian Mus., IX, p. 333 (♂; Phagu, Simla Hills). Brunetti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 151 (♀ ♂).

I have seen the female holotype at the British Museum and found it to have the characters of *Hirmoneura* proper. The male allotype is at the Indian Museum, Calcutta. Brunetti notes that in the male the eyes are narrowly separated, the frons being scarcely wider in the female.

Hirmoneura (Hirmoneura) austeni Lichtwardt

Hirmoneura austeni Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 643 (♂; Assam: Khasi Hills). Brunetti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 152 (♂).

I have seen three male cotypes at the British Museum and found that they have the characters of *Hirmoneura* proper. No additional specimens seem to have been collected.

Hirmoneura (Hirmoneura) cockerelli, new species

Male. — A large, thickset fly, similar in appearance to *H. austeni* Lichtwardt, characterized by the very dark legs and the conspicuous, broad band of pale pubescence at the base of the abdomen.

Integument uniformly black, the antennæ faintly blotched with rufous. Pruinosity dull, grayish-black dorsally, ashy gray ventrally and beneath the transverse band of pale hairs at the base of the abdomen; the humeral angles with a grayish-white pollinose area sharply set off from the remainder of the dorsum; there are faint indications of the beginning of two yellowish-gray stripes at the anterior margin of the thorax close to the head; otherwise thorax and abdomen appear unspotted. Body densely covered

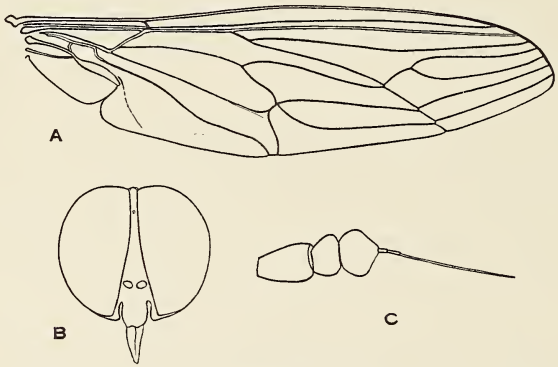


Fig. 1. *Hirmoneura cockerelli* J. Bequaert. A, wing; B, head seen in front; C, antenna.

with rather short pilosity, which is black on frons, dark brown dorsally on thorax and most of abdomen, pale grayish-yellow on the sides, ventrally, on the face, and on first and second antennal segments; a broad transverse band of whitish, somewhat silvery, long, erect hairs covers the apical half of the first and the basal half of the second abdominal tergites; there are long tufts of pale yellowish hairs on the sides of the thorax behind the bases of the wings.

Head (Fig. 1B) large, flattened, hemispherical in profile, about as wide as high seen in front, hardly broader than the thorax. Eyes uniformly covered with short, pale yellowish hairs, distinctly separated throughout by a narrow frons which is only slightly narrower than the ocellar triangle; the upper half of the frons is almost parallel-sided, but narrowest just below the anterior ocellus; the lower

half widens very rapidly toward the bases of the antennæ. Ocellar triangle very long and narrow, the anterior ocellus being placed close to the upper third of the distance separating the occiput from the antennæ; the ocellar triangle is faintly depressed in the middle, but not saddle-like. Antennæ (Fig. 1C) small, crowded together; first segment about twice as long as the second, slightly swollen throughout; second segment rather large; third segment flattened pear-shaped, distinctly longer and broader than the second, gradually narrowed apically. Style longer than the antenna, the two basal segments of very unequal length (the first the shorter). Legs rather slender, of normal shape.

Wing (Fig. 1A) long and comparatively narrow, less than four times as long as wide, rather uniformly yellowish-gray; veins yellowish-brown. Costa distinctly developed along the hind margin and reached by the diagonal vein. Alula broad. Venation normal, the same in both wings.

Length: 16 mm.; length of wing: 18 mm.; width of wing: 4.8 mm.

Holotype male, Doi Sutep, a mountain near Chieng Mai, northern SIAM, February 9, 1928 (T. D. A. Cockerell Collector. — M. C. Z., Cambridge, Mass.). The locality has an interesting flora, partly resembling that of the Himalayas (see T. D. A. Cockerell, 1929, Torreya, XXIX, pp. 159-162).

Hirmoneura (Hirmoneura) opaca Lichtwardt

Hirmoneura opaca Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 643 (♀; W. Himalaya: Kangra Valley, 4,500 ft.); 1913, Rec. Indian Mus., IX, p. 334 (♀ ♂; add. loc.: W. Himalaya: Mussoorie; Simla Hills; Nepaul: Pharping). Brunetti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 150, fig. 9, Pl. II, fig. 22 (♀ ♂; add. loc.: W. Himalaya: Dehra Dun).

Hirmoneura montana "Brunetti MS" Maxwell-Lefroy and Howlett, 1909, Indian Insect Life, p. 597 (without description; in Indian Museum collection from Mussoorie).

I have examined the female holotype at the British Museum. In the same collection there is a female, without

locality, labelled "*H. montana* Brun., paratype." I was unable to separate this from *opaca:* the eyes are hairy, the frons broad, the wings with two submarginal cells and the alula of normal width. The male allotype of *opaca* is at the Indian Museum, Calcutta.

Subgenus **Indohirmoneura** J. Bequaert

Hirmoneura (Indohirmoneura) coffeata Lichtwardt

Hirmoneura coffeata Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 644 (♀; Ceylon: Rambodde). Brunetti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 152 (♀).

The female holotype is at the Berlin Museum. I owe to the generosity of Mr. Lichtwardt a beautiful color sketch which he made of the type. It shows clearly the much narrowed alula and the adjoining axillary cell also narrower than usual.

Lichtwardt plainly stated in the paragraph preceding the description of *H. coffeata* that "the species which follow [*viz., H. coffeata, H. brunnea* and *H. orientalis*] have wholly bare eyes." This was unfortunately overlooked by Brunetti, so that he wrongly included in his key (1920) both *brunnea* and *coffeata* among the species with pubescent eyes.

Hirmoneura (Indohirmoneura) brunnea Lichtwardt

Hirmoneura brunnea Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 645 (♀; Ceylon: Rambodde and Trincomali). Brunetti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 151 (♀).

I have seen a female cotype at the British Museum. The alula is distinctly narrowed, though not as much as in Mr. Lichtwardt's sketch of *H. coffeata.*[1] According to the description, *H. brunnea* is a much smaller species than *H. coffeata* (wing 11 mm. long, about as long as the body, without the ovipositor, in *brunnea;* wing 24 mm. long and 5.5 mm. wide, much longer than the body, without the ovipositor, in *coffeata*). In addition, the pubescence of

[1]Miss D. Aubertin, who at my request examined once more the alula of the Oriental *Hirmoneuræ* at the British Museum, writes me that in the type of *H. brunnea* the alula is "very narrow."

the sides of the thorax and the base of the abdomen is yellow in *brunnea,* pale brown in *coffeata.*

Subgenus **Neohirmoneura** J. Bequaert

Key to Species

1. Small species, 11 to 13 mm. long. Abdomen black-haired at base; otherwise with alternating transverse zones of yellow and black pubescence. Antennæ, palpi and legs reddish-yellow. Wings tinged with gray, darker along anterior margin..... *H. annandalei* Lichtwardt.

   Larger species, body 15 to 17.5 mm. long, wing 17 to 20 mm. long .....2.

2. Smaller. Wing 17 mm. long, tinged with blackish-gray .....*H. orientalis* Lichtwardt.

   Larger. Wing 20 mm. long, of a uniform pale, semi-opaque brown. Antennæ, palpi and legs tawny or brownish-yellow. Frons of male wide, occupying about one-seventh of the width of the head..... *H. philippina* C. S. Banks.

Since I have seen none of these three species and since their published descriptions are not comparable, the key must remain unsatisfactory. The published figures of *H. orientalis* show a broad alula and two submarginal cells in the wing. It is assumed that the same is true of *H. annandalei* and *H. philippina.* I have my doubts as to the specific distinctiveness of *orientalis* and *philippina.*

In 1932 (Zoolog. Anzeiger, C, p. 15) I included in *Neohirmoneura, H. oldenbergi* Lichtwardt, of eastern Siberia, on the strength of the statement in the original description, "Augen kahl." In his recent monograph of Palearctic Nemestrinidæ (1933, Fliegen der Pal. Region, Lief. 75, p. 40), P. Sack redescribes the species from the type and states: "Augen lang und dicht hellbraun behaart." This is, however, an error. Dr. Walter Horn, who at my request kindly examined the type, writes that the eyes are bare.

Hirmoneura (Neohirmoneura) annandalei Lichtwardt

Hirmoneura annandalei Lichtwardt, 1913, Rec. Indian Mus., IX, p. 333 (♀ ♂; W. Himalaya: Simla, 7,000 ft.;

and Kufti, Simla Hills, 8,000 ft.). Brunetti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 149 (♀ ♂; add. loc.: Kufti to Phagu; Mahabaleshwar, Satara Distr., 4,200 ft.).

This species is known only from Western India. Holotype and allotype are at the Indian Museum, Calcutta. I have seen no specimens. Brunetti states that it is very like *H. cingulata* in size and color, "but, in addition to the bare eyes, it may be recognized by the black hairs on the abdomen being much shorter than the yellow ones, whereas in *H. cingulata* they are nearly or quite as long as the yellow ones."

Hirmoneura (Neohirmoneura) orientalis Lichtwardt

Hirmoneura orientalis Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 645 (♀; Formosa: Kosempo); 1919, Ann. Mus. Nat. Hungarici, XVII, p. 277 (♀ ♂; add. loc.: Formosa: Taihanroku). Matsumura, 1916, Thousand Insects Japan, Addimenta, II, p. 386, Pl. XXII, fig. 15 (♂). Esaki (and others), 1932, Iconogr. Insect. Japon., p. 143, fig. (♂).

The female holotype and male allotype are at the Budapest Museum. I have not seen the species. The male was recorded by Lichtwardt and figured by the Japanese authors, but was never adequately described.

Hirmoneura (Neohirmoneura) philippina C. S. Banks

Hirmoneura philippina C. S. Banks, 1921, Philippine Jl. Sci., XIX, p. 518, Pl. I, figs. 1-9 (♂; Philippines: Lanao, Kolambugan, Mindanao, 8° 10′ N., 123° 55′ E.).

The holotype is in the entomological collection, Bureau of Science, Manila. I have not seen the species. The author states that it differs from *H. annandalei* "in size, in the color of the hairs, there being no 'yellowish' abdominal hairs, in the color of the legs and in the width of vertex and frons with respect to eye width." No comparison is made with *H. orientalis,* which appears to be very closely related. Perhaps the best character of *H. philippina* resides in the shape of the hind tarsi, which in the male are much swollen basad and curved. It will be important to examine the males of *H. orientalis* and *H. annandalei* in this respect.

Subgenus **Hirmoneurilla** J. Bequaert

Key to Species

1. Antennæ pale chestnut-brown. Eyes covered with blackish-brown hairs, contiguous over about one-half of the length of the frons (in male); ocellar triangle about as long as wide. Wing subhyaline, slightly yellowish along costa.....*H. vitalisi* J. Bequaert.

   Antennæ bright yellow. Eyes covered with pale yellowish hairs, contiguous (in the male) or closely approximated (in the female) over one-third of the length of the frons; ocellar triangle longer than wide. Wing fairly uniformly yellowish-gray, more ochre-yellow along costa....*H. ochracea* Lichtwardt.

Hirmoneura (Hirmoneurilla) ochracea Lichtwardt

Hirmoneura ochracea Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 643 (♂; Burma: Tau Plateau, 4,000 ft.). Brunetti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 151 (♂).[2]

Specimens Examined. — LAOS: one male without more definite locality; two females, one the allotype, Pak Hang, Prov. Xieng Khouang (or Chieng Khuang), March 2, 1915 (R. Vitalis de Salvaza Collector).

I have compared these specimens with the holotype at the British Museum. The alula in this species is broader than in *H. austeni*, *H. opaca*, and *H. cingulata*.

Female (undescribed). — Differs scarcely from the male and is readily associated with it. The eyes are not properly speaking contiguous, but over about one-third of the length of the frons, below the ocellar triangle, they are separated by an extremely narrow area, which measures less than the width of the anterior ocellus.

Length (without ovipositor): 16 to 16.5 mm.; length of wing: 18.5 to 19 mm.; width of wing: 4.8 to 5 mm.

The allotype is at the M. C. Z., Cambridge, Mass.

In the two females the wing venation is normal and about the same in both wings; in the male, that of the left wing is normal, while in the right wing there is a supernumerary

[2]The type locality, misspelled "Jaoo" by Lichtwardt, was corrected by Brunetti.

cross-vein in the fourth posterior cell, dividing off the basal fourth of the cell.

Hirmoneura (Hirmoneurilla) vitalisi, new species

Male. — A large, thickset fly, similar in appearance to *H. austeni* Lichtwardt, characterized by the abdomen uniformly covered with pale yellowish pubescence, the russet-yellow antennæ, palpi and legs, the dark brown pilosity of the eyes and the nearly hyaline wings.

Integument almost uniformly dark chestnut-brown, somewhat darker on the dorsum of the thorax, paler ventrally on the abdomen; hind margin of abdominal tergites, especially the second and third, very narrowly black. Legs yellowish-red, the hind tibiæ and tarsi darker, chestnut-brown. Ocellar triangle and frons black, face dark brown; proboscis and palpi russet-yellow; antennæ pale chestnut-brown, apical third of style black. Pruinosity on under side of thorax white. Pilosity very abundant, dense, erect; black and long on ocellar triangle, frons and sides of face, russet on palpi, white on jowls and occiput; first and second antennal segments with long, black hairs; pilosity of dorsum of thorax and abdomen uniformly pale yellowish, with a few black hairs on the hind margins of the second, third and fourth tergites; that of under side of thorax and abdomen whitish-yellow, more or less matted ventrally, erect on the sides. Hairs of coxæ and base of femora long and white; those of remainder of legs mostly yellowish; those of hind tibiæ and tarsi mostly black, forming rather distinct fringes on the sides.

Head (Fig. 2B) large, hemispherical in profile, a little narrower than the thorax seen from above, about as wide as high seen in front. Eyes uniformly and densely covered with long, erect, blackish-brown hairs, contiguous over the upper half of the frons below the ocelli. Ocellar triangle short, almost as wide as long, scarcely depressed behind the anterior ocellus. Antennæ (Fig. 2C) small, crowded together; first segment short, slightly swollen, about twice the length of the second; second segment very short, transverse; third segment flattened, triangular in outline, wider than the second and about as long as wide. Style longer

than the antenna, the first segment only slightly shorter than the second. Legs stout, the hind tibiæ and tarsi slightly thickened; otherwise of normal shape.

Wing (Fig. 2A) very large, nearly four times as long as wide, subhyaline except along the anterior margin and at the base, where it is suffused with yellow; veins pale chestnut-brown. Costa distinctly developed along the hind margin and reached by the diagonal vein. Alula very broad. Venation normal, the same in both wings.

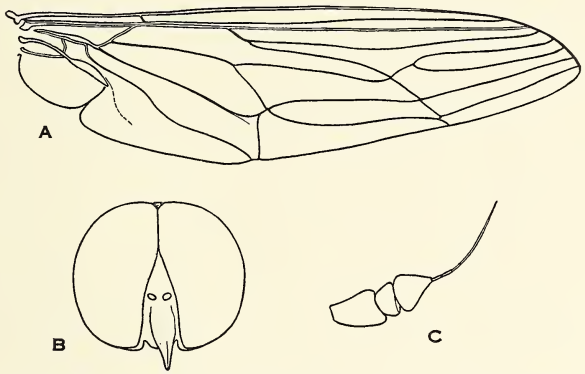


Fig. 2. *Hirmoneura vitalisi* J. Bequaert. A, wing; B, head seen in front; C, antenna.

Length: 18 mm.; length of wing: 19 mm.; width of wing: 5 mm.

Holotype male, Giaray, COCHINCHINA, February 24, 1921 (R. Vitalis de Salvaza Collector. — M. C. Z., Cambridge, Mass.).

This species is quite closely allied to *H. ochracea* Lichtwardt, from which it differs as shown in the key.

Subgenus **Hirmoneuropsis** J. Bequaert

Hirmoneura (Hirmoneuropsis) basalis Lichtwardt

Hirmoneura basalis Lichtwardt, 1910, Deutsch. Ent. Zeitschr., p. 595, fig. 3 (♂; erroneously described as from Ecuador; the type came from Northern India); 1913, Rec. Indian Mus., IX, p. 333 (♂; Burma: Dawna Hills, 2,000-3,000 ft.). Brunetti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 149 (♂).

The holotype, from Lichtwardt's collection, is now at the Deutsches Entomologisches Institut, Berlin-Dahlem, where I have seen it.

At the British Museum there is a specimen from Kolaw, S. Shan States, 4,000 ft. (F. M. Markwood Collector), which is possibly the undescribed female of *H. basalis*.

Subgenus **Hyrmophlæba** Rondani

Hirmoneura (Hyrmophlæba) laotica, new species

Male. — A large, thickset fly, similar in appearance to *H. obscura* and most Oriental species of the genus, though not closely related to any of them.

Integument of head, thorax and base of abdomen black; scutellum and juxta-alar tubercles dark brownish, the swollen margin of the scutellum bright ferruginous; antennæ (except style), palpi, proboscis and legs (except hind coxæ), bright yellowish-red; sides of second and most of succeeding tergites, most of the sternites and terminalia ferruginous-brown. Pruinosity uniformly dull gray, without markings or spots on thorax and abdomen; that of frons more yellowish; between the first and second tergite there is a narrow band of ashy-gray pruinosity. Body densely and uniformly covered with rather short, pale yellowish, erect hairs, longer on the head and on the sides and under side of the thorax; those below the base of the wing forming a yellowish tuft. A few black hairs mixed with the yellowish on the frons; first and second antennal segments densely covered with long, pale yellowish hairs. Hind femora and tarsi with short, appressed, bright rufous pilosity.

Head (Fig. 3B) large, hemispherical in profile, about as high as wide seen in front, not broader than the thorax. Eyes uniformly covered with short, yellowish-gray hairs, contiguous over most of the upper half of the frons. Ocellar triangle long and narrow, divided about midway by a transverse, saddle-like depression. Antennæ (Fig. 3C) small, crowded together; first segment about three times as long as the second, slightly swollen throughout; second segment very short, transverse; third segment flattened, pear-shaped, only slightly longer and not broader than the

second, rather abruptly narrowed apically. Style shorter than the antenna, the two basal segments short and thickened, of nearly equal length. Legs moderately stout, of normal shape.

Wing (Fig. 3A) long and comparatively narrow, about four times as long as wide, rather uniformly smoky, more yellowish along the anterior margin and near the base; veins yellowish. Costa distinctly developed along the hind margin and reached by the diagonal vein. The cross-vein which separates the first and second submarginal cells, reaches the third longitudinal at or slightly beyond its branching. Alula broad.

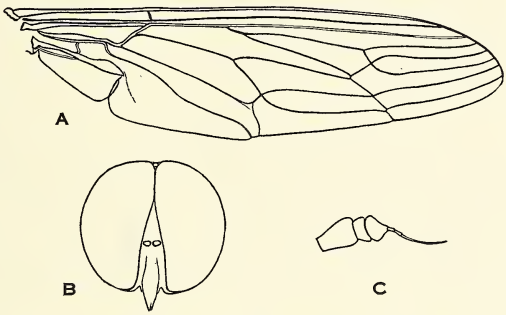


Fig. 3. *Hirmoneura laotica* J. Bequaert. A, wing; B, head seen in front; C, antenna.

Length: 15 to 16.5 mm.; length of wing: 16.5 to 17 mm.; width of wing: 4.3 to 4.5 mm.

Holotype male, Pang-Bo, Laos, March 29, 1920 (M. C. Z., Cambridge, Mass.). Two male paratypes, Pak Hang, Prov. Xieng Khouang, Laos, March 2, 1915 (R. Vitalis de Salvaza Collector).

This is the first species of the subgenus *Hyrmophlæba* known from the Oriental Region.

Subfamily Trichopsideinæ

I divide the Trichopsideinæ into the following six genera: *Atriadops* Wandolleck, *Nycterimyia* Lichtwardt, *Ceyloniola* Strand, *Nycterimorpha* Lichtwardt, *Cyclopsidea* Mackerras, and *Trichopsidea* Westwood. I have shown recently (1934, Jl. New York Ent. Soc., XLII, p. 181) that *Dicrotrypana*

Bigot, *Symmictus* Loew and *Parasymmictus* Bigot should all be united with *Trichopsidea,* these names being hardly worth retaining, even in a subgeneric sense.

The six genera may be tabulated as follows:

1. Ocelli absent. Alula vestigial .....*Atriadops.*
   Ocelli distinctly developed .....2.
2. Alula well developed, though narrower than usual...3.
   Alula vestigial or absent .....4.
3. Neither the third nor the fourth longitudinal veins branched; cross-veins present between second and third, and between first and second longitudinal veins; the whole forming two marginal, two submarginal, and only four posterior cells. Hind margin of wing more or less wavy. Hind femora swollen toward apex .....*Nycterimyia.*
   Both third and fourth longitudinal veins forked, the branches ending freely in the apical margin; cross-vein absent between first and second, present between second and third longitudinal veins; the whole forming one marginal, three submarginal, and five posterior cells. Hind margin of wing not wavy..... *Ceyloniola.*
4. Antennal style much flattened, leaf-like at apex. Wing of normal shape .....*Cyclopsidea.*
   Antennal style slender, or very slightly expanded at apex .....5.
5. Wing much narrowed toward the base, more or less club-shaped. Hind femora and tibiæ swollen apically .....*Nycterimorpha.*
   Wing of normal shape, not or scarcely narrowed toward the base. Femora and tibiæ not appreciably swollen .....*Trichopsidea.*

Cyclopsidea Mackerras (1925) contains only one species, of Queensland. One species of *Trichopsidea* occurs in New Guinea, Australia and Tasmania; and since the genus is otherwise known from the Mediterranean Subregion, the Ethiopian Region and North America, it will probably be found in the Oriental Region also.

Atriadops Wandolleck, 1897

Type by present designation: *Colax javanus* Wiedemann, 1824.

There appear to be only two well-established species of *Atriadops: A. vespertilio* (Loew) (= *A. africana* Wandolleck; *A. cinnamomea* Brunetti), a widely distributed Ethiopian insect, and *A. javana* (Wiedemann) of the Oriental Region. *A. macula* (Wiedemann), described from Brazil, is known only from the type, which, according to Lichtwardt, is labelled "Bahia." It is so poorly preserved that Lichtwardt was unable to decide whether it belonged to *Atriadops*. No specimen of *Atriadops* has been recorded from the New World for over a century.

Atriadops javana (Wiedemann)

Colax javanus Wiedemann, 1824, Analecta Entom., p. 18 (♂; Java); 1830, Aussereurop. Zweifl. Ins., II, p. 261 (♂). Bigot, 1891, Jl. Asiat. Soc. Bengal, LX, pt. 2, p. 281. v.d. Wulp, 1891, Sumatra Exped., Diptera, p. 26 (add. loc.: Sumatra); 1896, Cat. Dipt. South Asia, p. 69.[3]

Atriadops javana Wandolleck, 1897, Entom. Nachr., XXIII, p. 246, fig. 1. Kertész, 1909, Cat. Dipt., IV, p. 31. Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 650 (♀ ♂; add. loc.: Ceylon: Trincomali. Northern Territory of Australia: Palmerston. Queensland: Cape York and Townsville); 1919, Ann. Mus. Nat. Hungarici, XVII, p. 277 (♂; add. loc.: Formosa: Taihanroku). Brunetti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 155 (♂). Mackerras, 1925, Proc. Linn. Soc. New South Wales, L, pt. 4, p. 552, figs. 14 *a-d* (♀ ♂; add. loc.: Queensland: Cape Greville; Port Curtis; Port Denison; Gayndah; Brisbane; Toowoomba. New South Wales: Coff's Harbour). Sack, 1933, in Lindner, Fliegen Pal. Reg., Lief. 75, p. 41, fig. 29; Pl. I, fig. 11 and Pl. III, fig. 40 (♀ ♂).

Atriatops javana Hardy, 1924, Proc. Linn. Soc. New South Wales, XLIX, pt. 4, p. 456, figs. 2 and 8.

Atriadops iavana J. Bequaert, 1932, Zoolog. Anzeiger, C, p. 33 (♂; add. loc.: Mioko, Duke of York Island).

[3]The specific name was originally spelled "*iavanus*," but later corrected by Wiedemann to "*javanus*."

Colax (?) *variegatus* Westwood, 1848, Cabinet of Oriental Entomology, p. 38, Pl. XVIII, figs. 5-5*a* (no sex; China). Walker, 1849, List Dipt. Brit. Mus., II, p. 235. Bigot, 1891, Jl. Asiat. Soc. Bengal, LX, pt. 2, p. 281. v.d. Wulp, 1896, Cat. Dipt. South Asia, p. 69 (add. loc.: Singapore; Sumatra).

Atriadops variegata Wandolleck, 1897, Entom. Nachricht., XXIII, p. 247, fig. 3. Kertész, 1909, Cat. Dipt., IV, p. 31.

Atriadops westwoodi Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 650 (♂; New Guinea); 1910, *Loc. cit.*, p. 624.

Colax javana? Walker, 1850, Insecta Saundersiana, Diptera, Pl. V, figs. 4-4*a-c* (drawn by Westwood, not mentioned in the text).

Specimens Examined. — LAOS: Paklay, one male (Vitalis de Salvaza. — Paris Mus.). — FORMOSA: Kaukau, two females and fourteen males, September 1912 (H. Sauter Collector. — Deutsch. Ent. Inst., Berlin-Dahlem). — QUEENSLAND: Coen, Cape York, one male, May, 1932 (J. P. Darlington Collector. — M. C. Z.); Burnett River District (Brit. Mus.); Enongera near Brisbane (Brit. Mus.). — NEW SOUTH WALES: Sydney, one female (Brit. Mus.).

I have also seen the holotype, very badly preserved, of *Colax variegatus* at the British Museum. It is labelled "Foo-chow, China." That part of China has, like Formosa, a truly Oriental, tropical fauna. There is no evidence that *A. javana* enters the Palearctic Region, proper.

Nycterimyia Lichtwardt, 1909

Nycterimyia, originally established as a monotypic genus for *Trichopsidea dohrni* Wandolleck, now contains four Oriental, one Australian, one Papuan and three Ethiopian species.

Key to Oriental, Australian and Papuan Species
(partly after Lichtwardt, 1912)

1. Wings uniformly brownish, without hyaline spots or fenestræ. Formosa ..... *N. fenestro-inornata* Lichtwardt.
   Wings brownish, with distinct hyaline streaks, spots or fenestræ ..... 2.

2. Fourth posterior cell only with a narrow, somewhat curved, hyaline streak; small, subhyaline areas in the combined first and second posterior, and in the second basal cells. New Guinea ..... *N. papuana* J. Bequaert.

   Large hyaline fenestræ at least in the first submarginal and axillary cells .....3.

3. Wings moderately wavy along hind margin. No hyaline spots in the combined first and second posterior cells; second basal cell mostly hyaline; large fenestræ in discal and fourth posterior cells .....4.

   Wings strongly wavy along hind margin. Combined first and second posterior cells with two small, hyaline spots; no hyaline spot in discal cell.....5.

4. The longitudinal veins end almost straight in the costa. Smaller, darker species. Formosa..... *N. fenestro-clathrata* Lichtwardt.

   The longitudinal veins distinctly curved upward at apex. Larger, paler species. Formosa..... *N. kertészi* Lichtwardt.

5. Hyaline fenestra of axillary cell concave apically, with a pointed upper extension; very small hyaline spots in second basal cell. Queensland..... *N. horni* Lichtwardt.

   Hyaline fenestra of axillary cell with almost straight apical margin, without upper extension; a large hyaline fenestra in second basal cell. Sumatra, Mapor, Andaman Islands.....*N. dohrni* (Wandolleck).

Nycterimyia dohrni (Wandolleck)

Trichopsidea dohrni Wandolleck, 1897, Entom. Nachr., XXIII, p. 251, figs. 7-8 (♂; Sumatra). Kertész, 1909, Cat. Dipt., IV, p. 32. Brunetti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 153 (♂).

Nycterimyia dohrni Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 647 (♂; add. loc.: Rhio Archipelago: Mapor or Panjang Id.;[4] Andaman Islands: Ross Isl.); 1912, Ent. Mitt., Berlin, I, p. 27.

I have seen the male from the Andaman Islands at the

[4]The misspelling "Mafor" was corrected by Mr. Lichtwardt in the working copy of his paper, now in my library.

British Museum and the male from Mapor at the Munich Zoölogical Museum. The type is in the Stettin Museum.

Nycterimyia kerteszi Lichtwardt

Nycterimyia kertészi Lichtwardt, 1912, Ent. Mitt., Berlin, I, p. 27, Pl. II, fig. 2 (♀; Formosa: Fuhosho); 1919, Ann. Mus. Nat. Hungarici, XVII, p. 277.

The type is in the Budapest Museum.

Nycterimyia fenestro-clathrata Lichtwardt

Nycterimyia fenestro-clathrata Lichtwardt, 1912, Ent. Mitt., Berlin, I, p. 28, Pl. II, fig. 3 (♀; Formosa: Fuhosho); 1919, Ann. Mus. Nat. Hungarici, XVII, p. 277.[5]

The type is in the Budapest Museum. I am not quite convinced that this is specifically distinct from *N. kertészi* Lichtwardt.

Nycterimyia fenestro-inornata Lichtwardt

Nycterimyia fenestro-inornata Lichtwardt, 1912, Ent. Mitt., Berlin, I, p. 28, Pl. II, fig. 4 (♂; Formosa: Fuhosho); 1919, Ann. Mus. Nat. Hungarici, XVII, p. 277.

Specimen Examined. — FORMOSA: Hoozan, one male (H. Sauter Collector. — D. E. Institut, Berlin-Dahlem).

The type is in the Budapest Museum.

Ceyloniola Strand, 1928

(*Ceylonia* Lichtwardt, 1909)

The only species of *Ceyloniola* is a beautiful, large fly (♂ 16 mm. long, wing 16 mm. by 5 mm.), readily recognizable by the peculiar venation and markings of the wings. These are mostly hyaline, with dark brown base, irregularly edged median cross-band (over base of discal cell, reaching anterior but not posterior margin) and irregularly edged preapical band connected along anterior margin with the dark-brown tip.

Ceyloniola magnifica (Lichtwardt)

Ceylonia magnifica Lichtwardt, 1909, Deutsch. Ent. Zeitschr., p. 646, fig. 5 (♂; Ceylon: Pundaluoya). Bru-

[5]Originally misspelled "*fenestro-clatrata,*" the specific name was corrected by the author in 1919.

netti, 1920, Fauna Brit. India, Dipt. Brach., I, p. 156, Pl. II, fig. 23 (♂).

Atriadops nivea Brunetti, 1912, Rec. Indian Mus., VII, p. 477, Pl. XXXVII, fig. 11 (♂; Ceylon: Haldumulla).

I have seen two males, including the holotype, at the British Museum.

Nycterimorpha Lichtwardt, 1909

Nycterimorpha was originally erected as a monotypic genus for *Nycterimorpha speiseri* Lichtwardt, of Queensland. Edwards has recently added an Oriental species.

Nycterimorpha pyralina Edwards

Nycterimorpha pyralina Edwards, 1932, Stylops, I, p. 138, figs. 1, 1*b*, 1*c*, 2*a* (♂; Malay Peninsula: Fraser's Hill, Paháng, 4,000 ft.).

I have seen the holotype at the British Museum.

THE MATURE LARVA AND PUPARIUM OF *PHYSOCEPHALA SAGITTARIA* (SAY) (DIPTERA, CONOPIDÆ)[1]

By Lee H. Townsend

Illinois State Natural History Survey, Urbana

The larvæ of the Conopidæ, so far as known, are parasitic upon other insects, living within the body and consuming the non-vital parts. The larvæ pupate here also, pass the winter in this stage and the adults emerge the following spring or summer.

There are many more records of these parasitic flies in European than in American literature. Brauer (1883) listed the literature concerning the immature stages and biology. He also gives the family characters, as understood by him, for the larvæ. According to de Meijere (1903), these characters, as given by Brauer, do not hold true for the larvæ of the three known genera. Since Brauer mentioned the anterior spiracles, it seems he must have had a specimen of the conopid genus *Sicus*. This should be borne in mind when using his description. Williston (1885) gives a translation of Brauer's characters. In two papers de Meijere (1903, 1912) compiled all published information on the biology of the family and added much new material. These papers are indispensable to anyone studying the biology of the group. In his account of the family, Brunetti (1923) makes some general statements concerning the larvæ and their life history. He adds nothing new. In 1926, Silvestri described a conopid larva from a specimen of *Termes gilvus* Hagen received from the Philippines. The species was not known. This larva was living in the head of the termite and is apparently the only case so recorded.

[1]Contributions from the Entomological Laboratories of the University of Illinois, No. 173.

As reported, the species are parasitic upon various genera of bees, wasps, ants, termites, and grasshoppers. Brauer (l. c.) gives a list of the genera from which these parasitic flies had been reported and very little has been added since. Brauer's list of host genera was copied by Williston (l. c.). The genus *Stylogaster* is probably parasitic upon ants of the genus *Eciton.* Aldrich (1930) gives information received from Dr. Wm. Mann and Dr. C. H. Curran concerning the habits of adults with reference to armies of moving ants in Central America. Only one genus (*Œdipoda*) of Orthoptera has been reported as parasitized by the Conopidæ. The termite record of Silvestri is the only authentic one available. Bates (1863) has been credited with saying in his Naturalist on the River Amazons (vol. 1) that these larvæ attack termites but Aldrich (l. c.) states that he could find no such reference in any of Bates' works. Frison (1926) reported the rearing of *Physocephala sagittaria* (Say) (det. J. R. Malloch) from the abdomen of dead workers of *Bremus auricomus* (Robts.). The same author (1930) recorded this parasite from *Bremus americanorum* (Fabr.).

The material upon which this paper is based was reared from workers of *B. auricomus* (Robts.) by Dr. T. H. Frison, Chief of the Illinois State Natural History Survey, and to him the writer expresses sincere thanks for being permitted to describe it. The writer wishes also to thank Dr. C. O. Mohr, Associate Entomologist, Illinois State Natural History Survey, who drew figures 1, 4, 5, and 6.

Mature larva. — The larva (fig. 4) has a broad, somewhat rounded body. The cephalic portion, or head and thoracic region, is much narrowed and being somewhat extensible, projects from the body much as a snout. This portion can be varied in thickness by the larva. The larva can be described as being typically pyriform. Relaxed and extended it measures approximately 13 mm. in length and 5 mm. in breadth at the widest portion. The narrowest cephalic portion is approximately 1 mm. wide. The body narrows to approximately 3 mm. at the location of the posterior spiracles.

The color is yellowish white. No attempt has been made

to determine the actual number of body segments. It is evident enough that there are eight segments which compose the posterior widened portion. Anterior to these eight there are several more, probably three, which make up the narrowed snout-like anterior portion of the body.

On each side and above the mouth there is a short, broad, pointed projection (figs. 7, 8, p). These structures probably bear sense organs. The mouth (m) is immediately below and between these cephalic projections and is shown in figure 7. At the base of these projecting structures on the dorsal aspect (figs. 7, 8, n) is a slender transverse sclerotized bar. On the ventral aspect also is found a sclerotized structure which extends transversely, surrounding the base of the projections, and widens mesally to form an inverted V (fig. 7, o).

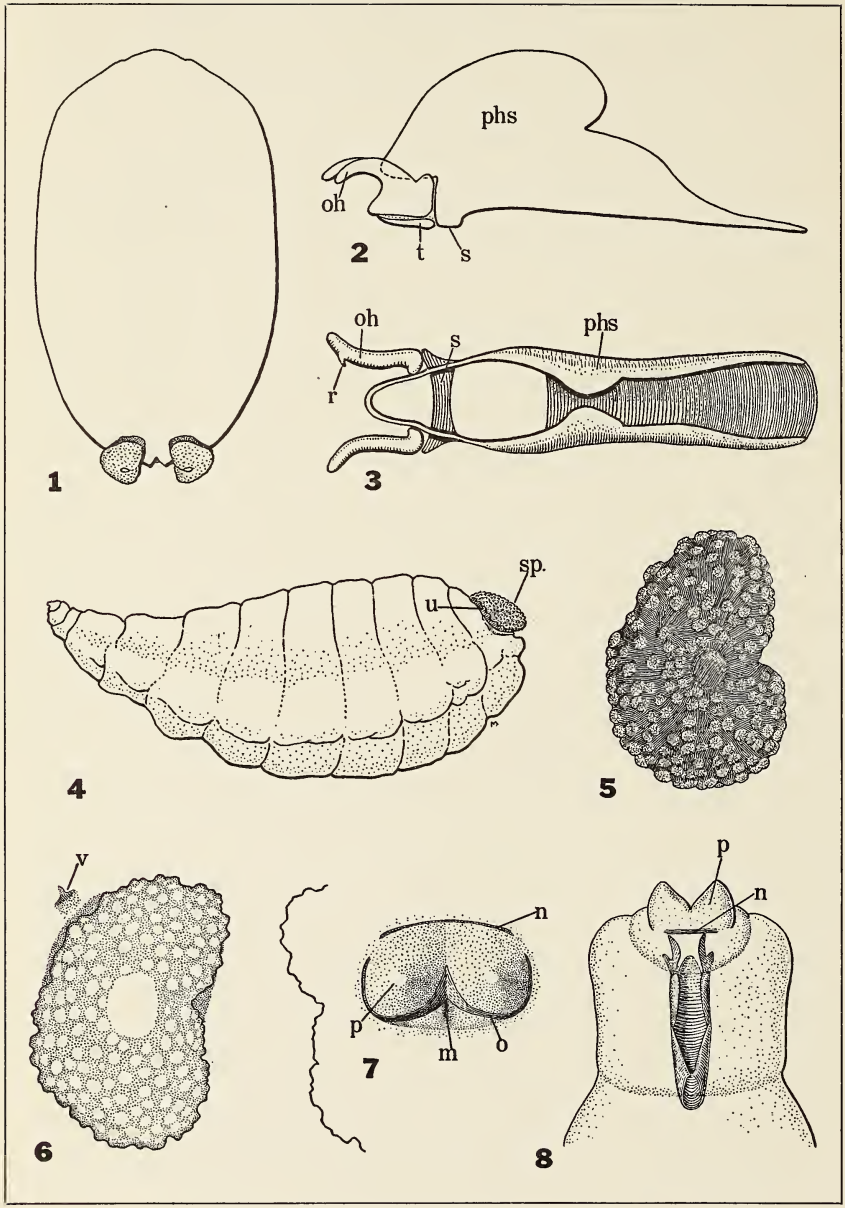
The *cephalo-pharyngeal* skeleton is withdrawn into the anterior end of the body (fig. 8) and is composed of several principal sclerites. The most anterior are the *oral hooks* (figs. 2, 3, oh). These are simply curved and bear on the ventro-caudal surface a tooth. This basal tooth is prominent and extends cephalo-ventrad. On the mesal margin and well toward the cephalic end of the right *oral hook* is a small tooth (fig. 3, r), which projects meso-caudad. The left *oral hook* possesses no such tooth. The intermediate sclerite which is present in the *cephalo-pharyngeal skeleton* of many of the higher Diptera is absent. The *oral hooks* articulate basally with the large *basal* or *pharyngeal sclerite* (figs. 2, 3, phs). The latter is formed of two lateral, vertical plates which are joined ventrally to form a trough which supports the pharynx. The *pharyngeal sclerite* is more weakly sclerotized than the remaining parts of the *cephalo-pharyngeal skeleton.* The sclerotization is strongest in the region of the point of union of the two plates and decreases as the dorsal and caudal portions are approached. The shape of these plates is rather difficult to describe but is shown in figure 2. At the ventro-cephalic end these plates are connected by a sclerotized cross-bar (s). Caudad of this cross-bar is a quadrangular opening in the trough formed by the *pharyngeal sclerite.* More or less joined to each lateral plate of the *pharyngeal sclerite* at its ventro-

cephalic margin and extending cephalad below each oral hook is an elongate sclerite (t). This sclerite probably aids in supporting the walls of the pharynx. The cephalic end of the *pharyngeal sclerite* extends cephalad to form a weakly sclerotized, curved bar which aids in strengthening the roof of the pharynx.

The anterior spiracles are absent but the posterior ones are well developed and conspicuous. These are two kidney-shaped plates on the last segment (fig. 4, sp). They are strongly convex and vary in color from a reddish-brown to a dark brown depending upon the age of the larva. The stigmal plates bear numerous wart-like protuberances (fig. 6) and on each plate there is, approximately centrally placed, a round pale spot. Surrounding these convex plates at the base is a narrow rim or collar-like structure (fig. 4, u). In most specimens this collar is slightly darker than the remainder of the plate. Each stigmal plate is slightly emarginate in the mid region of its mesal border. The surrounding rim is widest at this emargination. Slightly beyond the dorso-lateral margin of each stigmal plate there is a small spine (fig. 6, v). This structure appears to be sclerotized and is the color of the stigmal plate. The wart-like protuberances of the stigmal plates seem especially significant and these with the general shape of the larva should enable it to be recognized as a conopid. The anus lies immediately ventrad of the stigmal plates.

Puparium. — The puparium (fig. 1) is formed within the abdomen of the host and is approximately 8 mm. in length and 5 mm. in breadth. It is reddish or dark brown in color. The individual segments are very poorly indicated and the surface is smooth. The stigmal plates (figs. 1, 5) retain their characteristic appearance but project outward more than in the larval stage. They are slightly smaller and the shape is not exactly as it was during the preceding stage. Figures 5 and 6 illustrate this difference in size and shape. Each stigmal plate appears as though a string had been tied around its base and the string tightened thus causing the plate to become more convex and to bulge. The wart-like protuberances are even more prominent than in the larval stage.

Psyche, 1935 VOL. 42, PLATE XII.



Townsend—*Physocephala sagittaria*

As de Meijere (1903) has pointed out the number of wart-like protuberances on the stigmal plates varies much in the known larval forms. This writer figures the stigmal plates of the three genera known in the larval stage and there seem to be considerable differences there. The present writer is of the opinion that were known larval forms available it would be quite possible to make at least a generic key.

The only larval key known to the writer which includes this family is that of Brues and Melander (1932). These workers attempted only to separate the family from related families. They mentioned that the wart-like antennæ were tipped with a sclerotized ocellus-like ring but the present writer could find no such structure on the species considered in this paper. The conopid genera, keyed out below, have been reared from the following genera of Hymenoptera: *Zodion:* from *Hylaeus, Odynerus,* and *Halictus; Sicus* from *Bremus; Physocephala* from *Apis, Xylocopa, Bremus, Bembex, Philantus, Eucera, Halictus, Megachile,* and *Sphingonotus.* These three conopid genera have been reported only from genera of bees and wasps. Of the ten North American genera of Conopidæ, three are known as larva and the following key is offered to these:

1. Two elongate, distally tapering structures projecting from the caudo-ventral region of the body. Tracheæ extending into these structures.....*Zodion.*
   No such projecting structures present.....2.
2. Anterior spiracles present.....*Sicus.*
   Anterior spiracles absent.....*Physocephala.*

Explanation of Plate 12

All are enlarged figures of *Physocephala sagittaria* (Say)

1. Dorsal aspect of puparium.
2. Left lateral aspect of cephalo-pharyngeal skeleton of larva.
3. Dorsal aspect of cephalo-pharyngeal skeleton of larva.
4. Left lateral aspect of larva.
5. Left posterior spiracle of puparium.
6. Left posterior spiracle of larva.
7. Cephalic aspect of head region of larva.
8. Dorsal aspect of anterior region of larva with *cephalo-pharyngeal* skeleton showing through the cuticula.

ABBREVIATIONS

m — mouth.
n — sclerotized bar on head region.
o — sclerotized area at base of head projection.
oh — oral hooks.
p — projection of head region.
phs — pharyngeal sclerite.
r — mesal tooth of right oral hook.
s — ventral cross-bar.
sp — spiracle.
t — sclerite below oral hook.
u — collar surrounding spiracle.
v — spine dorso-laterad of spiracle.

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A NEW RIODINID FROM PANAMA (LEPIDOPTERA)

By Marston Bates

Museum of Comparative Zoölogy, Cambridge, Mass.

Genus **Rodinia** Westwood

This generic name was proposed by Westwood (1851, Gen. diurn. Lep., II, p. 430) for a number of species, including *Erycina calphurnia* Saunders (1849, Trans. ent. Soc. London (1), 5, p. 216), which was designated as the genotype by Stichel (1909, Berl. ent. Zeits., 54, p. 42), although Saunders had proposed the name *Euerycina* for his species in 1859 (Trans. ent. Soc. London, (2), 5, p. 95), and restricted *Rodinia* to the other species listed by Westwood (*l. c.*). Stichel's action seems to be entirely in accordance with the provisions of the International Code of Nomenclature, even though it is not in strict accordance with the historical usage of the names involved.

Three "species" have been described in the genus: *Erycina calphurnia* Saunders (1849, *l. c.*); *Euerycina delphinia* Staudinger and Schatz (1888, Ex. Schmet., I, p. 248, pl. 89) and *Rodinia* (*Euerycina*) *vulnerata* Röber (1923, Stett. ent. Zeit., 84, p. 94). All were based on Amazonian material, and as only a few specimens are known, the status of these names is uncertain. The discovery of a related form in the rain forest of Panama is surprising.

Rodinia barbouri sp. n.

♂. The ground color is dark grey; the upper side of the forewing has a straight, white, lavender-bordered, median band, which does not quite reach the costal margin, and ends on the outer third of the inner margin; the lower two thirds of the outer margin is bordered by blue. The outer margin of the hindwing is completely margined by blue, and the tail is entirely blue except for an apical fringe of white scales. An orange band, which begins at the base

of the cubital stem and gradually widens, ends on the inner margin between veins Cu_2 and 2A; the white median band, which begins on the costal margin, becomes entirely blue where it joins the orange band. The under side is similar, except that the base of the wings is clothed with blue-grey scales, and the orange band of the hindwing is reduced to an elongate spot. Length of forewing, 23 mm.

This species is similar to that described as *Euerycina delphinia* by Staudinger (*l. c.*). A male in the M. C. Z., from Macicore, Amazonas, which agrees very well with Staudinger's description and figure, has the outer margin of the forewing slightly concave, whereas in *barbouri* it is somewhat convex; the tail of *barbouri* is relatively shorter, and the outer margin of the hindwing is more evenly rounded; the white band of the upper side of the forewing is more uniform and narrower in *barbouri*. On the under side, the subapical white shading of the forewing of *delphinia* is lacking in *barbouri*, and the white band of the hindwing is narrower, the orange spot larger, than in *delphinia*. The names *calphurnia* and *vulnerata* were based on females, in which the markings are quite different.

Type, a male in the Museum of Comparative Zoölogy, from Barro Colorado Island, Canal Zone, 29. XI. 1934, M. Bates.

THE AUSTRALIAN ANT GENUS MAYRIELLA FOREL

By William Morton Wheeler

Biological Laboratories, Harvard University

The primitive Meranopline genus Mayriella was established by Forel more than thirty years ago for a minute worker ant, *M. abstinens,* taken by Gilbert Turner in Queensland.[1] Since that time, except for brief consideration in Emery's volume on the Myrmicinæ in Wytsman's "Genera Insectorum" and citation in a few faunal lists, the insect has remained unnoticed.[2] This neglect is due no doubt to its rare or very local occurrence and diminutive size. I find in my collection only a small number of specimens which are clearly referable to Mayriella, but they belong to two species. One of them is a worker of an undescribed species, another a cotype of *abstinens* received from Prof. Forel. There are also specimens of two subspecies of this form and the series of one of them comprises several females. The male Mayriella, unfortunately, is still unknown. In the following pages I include descriptions and figures of these forms, which are of interest in connection with two other primitive genera of Meranoplini, namely Willowsiella and Romblonella, which I have recently described.[3] It seems advisable also to amplify Forel's generic diagnosis and to redescribe *abstinens* from the cotype.

Mayriella Forel

Worker. Monomorphic, minute, thickset, with hard, sculptured integument. Head rather large, shaped much

[1] *Forel, A.* Rev. Suisse Zool. 10, 1902, pp. 452-454.

[2] Viehmeyer (Ent. Mitteil. 13, 1924, p. 26) has, indeed, described a *Mayriella overbecki* from Trial Bay, New South Wales, but I fail to detect anything in his account that does not apply to the typical *M. abstinens.*

[3] Formicidæ of the Templeton Crocker Expedition, 1933. Proc. Cala. Acad. Sci. 21, 1934, p. 174-176, Fig. 1 and "Two New Genera of Myrmicine Ants from Papua and the Philippines," Proc. New England Zool. Soc., 1935, pp. 1-9, Fig. 2.

as in Meranoplus. Eyes set obliquely, slightly in front of the middle of the head, moderately large and convex, but consisting of comparatively few hemispherical facets (only 4 or 5 in the greatest transverse diameter), elongate-elliptical, produced inferoanteriorly as a distinct point. Ocelli absent. Mandibles rather small, with short, oblique, 4-toothed apical borders. Clypeus short, its posterior portion forming an elevated, laterally marginate plate, terminating on each side anteriorly in a small, sharp tooth and extending back between the frontal carinæ. In profile the outline between the anterior edge of the median plate and the anterior border of the clypeus is strongly concave. Frontal carinæ widely separated, subangulate, laterally expanded and lamellate anteriorly but not reaching the sides of the head and hence more as in Triglyphothrix than in Meranoplus, continued backward as two sharply, only moderately divergent ridges which form the mesial borders of broad, deep, supraocular scrobes that are rounded posteriorly and each large enough to contain the whole folded antenna. Frontal area distinct, frontal groove obsolete. Antennæ 10-jointed; scape short, first funicular joint conspicuously enlarged, joints 2-7 short and transverse, the seventh longer than the others which are small and narrow, the two terminal joints forming a large club, the last joint of which is much larger than the penultimate, as long as the remainder of the funiculus without the first joint. When the antenna is folded into the scrobe, the club is turned mesially so that it overlies and conceals nearly the whole scape and fits into the space between the plate and depressed lateral portion of the clypeus. Thorax short and stout, the pronotum large, moderately convex, with sharply rectangular humeri and submarginate sides; promesonotal and mesoëpinotal sutures obsolete, the latter replaced by a dorsally transverse, longitudinally costate groove; epinotum short and narrow, sloping, armed with a pair of teeth or spines which are placed low down; metasternal angles distinct but rounded. Petiole and postpetiole with well-developed but not enlarged nodes, the petiole subpedunculate anteriorly, with an anteroventral tooth. Gaster much as in Meranoplus, oval, with about

three fourths of its dorsal surface consisting of the first segment. Sting apparently vestigial. Legs short; middle and hind tibiæ spurless; tarsal claws slender and simple.

Female. Very similar to the worker but decidedly larger and differing in the usual sexual characters. Eyes larger, with their pointed anterior ends terminating near the corners of the clypeus. Ocelli small, not closely approximated. Thorax narrower than the head; pronotum short, truncated anteriorly, with sharply rectangular humeri; mesonotum large, flattened above. Pedicel and gaster proportionally stouter than in the worker, the latter more elongate-elliptical. Wings long, narrow, pubescent, the anterior pair with well-developed, elongate pterostigma, open submarginal cell, a single long cubital cell and a small, discoidal cell; hind wings nearly veinless.

Genotype: *Mayriella abstinens* Forel

Mayriella resembles both Willowsiella and Romblonella in the shape of the head and thorax, the position of the eyes and the absence of promesonotal and mesoëpinotal sutures but differs from both in its much smaller size and in the number of antennal joints, which is 11 in Willowsiella and 12 in Romblonella, with 3-jointed clubs. Moreover, the former of these genera lacks antennal scrobes and both have the petiole greatly enlarged. This is true also of the postpetiole in Romblonella.

No observations have been published on the habits of Mayriella. My note-book shows that on Nov. 2, 1914, I found at Cairns, Queensland, three small colonies of *M. abstinens* nesting in sand. Each nest was a small regular crater slightly more than an inch in diameter, with a minute central entrance. Each colony comprised between 50 to 100 workers, which were huddled together with their scanty brood in small chambers only about an inch beneath the surface of the sand. The nests, except in their diminutive size, were exactly like those of several of the smaller species of Meranoplus (*oceanus, nanus,* etc.) which are common in sandy spots in the open Australian bush. Although I collected several of the *abstinens* workers I have since been unable to find them among my mounted material and suspect that they must have been lost among

much larger ants collected on the same day and placed in the same vial. The type of the subsp. *venustula*, described below was taken by the late Mr. A. M. Lea "in rotting leaves," that of *spinosior* sp. nov. by the same collector "among fallen leaves."

The workers of the four known forms of Mayriella may be separated by means of the following table.

1. Epinotum armed with spines which are at least twice as long as the diameter of their bases; petiolar node truncate above in profile; anterior corners of postpetiole distinctly produced and subdentate..... *spinosior* sp. nov.

   Epinotum armed with teeth, which are not longer than the width of their bases; petiolar node with rounded summit; anterior corners of postpetiole not produced .....2.
2. Head, thorax and pedicel dark brown; sculpture coarse. *abstinens venustula* subsp. nov.

   Head, thorax and pedicel paler, yellow-brown; sculpture finer .....3.
3. Epinotal teeth blunt, shorter than the width of their bases; postpetiole above smooth and shining..... *abstinens* Forel (typical)

   Epinotal teeth acute, as long as the width of their bases; sculpture coarser; postpetiole above finely punctate, subopaque .....*abstinens hackeri* subsp. nov.

Mayriella abstinens Forel

(Fig. 1 a – c)

Worker. Length 1.4-1.5 mm.

Head subtrapezoidal, slightly longer than broad, narrower in front than behind, with rounded sides and posterior corners and broadly sinuate posterior border. Mandibles rather flat, with straight external borders. Elevated median plate of clypeus subtrapezoidal, slightly longer than broad, broader in front than behind, its surface distinctly concave, its anterior border broadly emarginate between the teeth. Antennal scapes short, scarcely reaching to the posterior fourth of the head, thin at the base, swollen in the middle; first funicular joint keg-shaped, one and one-

half times as long as broad, joints 2-6 twice as broad as long, the seventh distinctly longer, the eighth slightly broader than long, one-third as long as the more swollen terminal joint. Thorax less than twice as long as broad; promesonotum excluding the neck narrower than the head, subtrapezoidal, anteriorly twice as broad as posteriorly, with feebly rounded anterior and nearly straight, marginate anterior and lateral borders; in profile rising rather abruptly from the neck, moderately and evenly rounded above, slightly sloping behind to the short, feebly costate, transverse mesoëpinotal groove or impression; base of epinotum quadrate, sloping with slightly raised anterior border and marginate sides, the marginations enlarging below to form a pair of small, blunt, flattened teeth, which are shorter than their basal diameter; epinotal declivity much shorter than the base, continuing down in the same sloping plane between the metasternal lobes. Petiole but little longer than broad, narrowed anteriorly, its node broader than long, subrectangular, with straight, transverse anterior border and straight, parallel sides; in profile subcuneate, higher than long, with straight ascending anterior slope, meeting the shorter, evenly convex posterior slope at a distinct angle; ventral surface of petiole straight and horizontal, the tooth at its anterior end blunt and translucent. Postpetiole from above nearly one-third broader than the petiole, one and one-half times as broad as long, rounded-oblong; in profile broadly rounded above, ventrally slightly convex in the middle. Gaster about as large as the head, convex above and below, its anterior border concave in the middle, its anterior corners marginate on the sides.

Shining; head, thorax and petiole more subopaque; mandibles smooth, sparsely and very finely punctate; sides of clypeus transversely rugulose, its elevated median plate smooth and shining. Head, thorax, petiole and ventral portion of postpetiole very finely and microscopically, the scrobes, neck, pleuræ, posterior surface of epinotum, the petiole and ventral portion of the postpetiole more coarsely and evenly reticulate; front of head also feebly, longitudinally rugulose, its posterior corners and the promesono-

tum with a coarser, superimposed reticulate rugulosity and with the spaces between the rugules occupied by shallow, circular foveolæ, the cavities of which, however, exhibit the fundamental microscopic reticulation. Node of post-

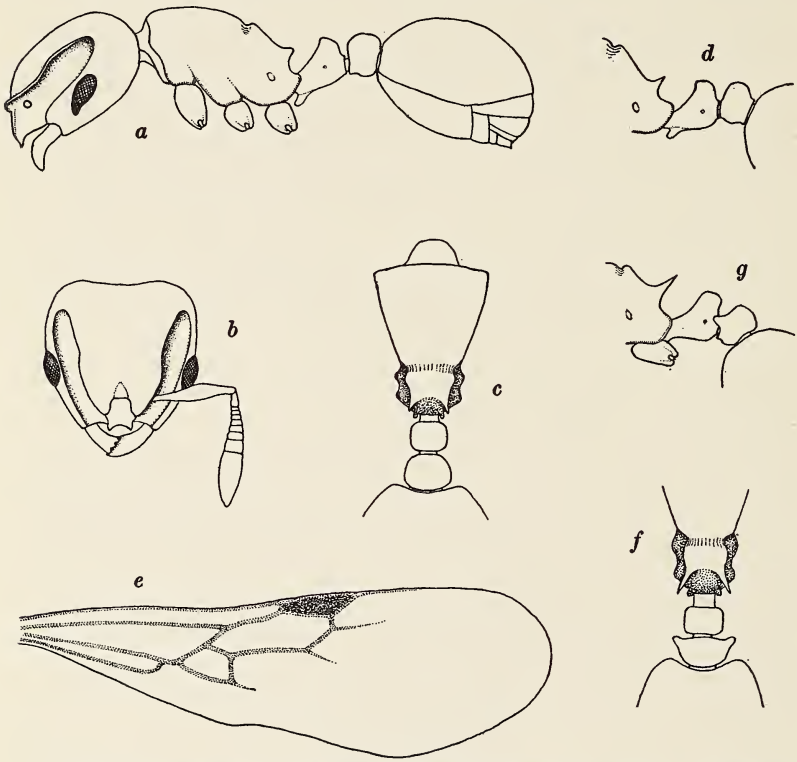

Fig. 1. *a, Mayriella abstinens* Forel, worker in profile; *b*, head of same dorsal view; *c*, thorax and pedicel, dorsal view; *d, M. abstinens hackeri* subsp. nov., epinotum and pedicel of worker in profile; *e*, wing of female; *f, M. spinosior* sp. nov., epinotum and pedicel of worker, dorsal view; *g*, same in profile.

petiole smooth and more shining than the petiolar node; gaster, legs and antennæ very smooth and shining.

Pilosity white, erect, long, and very sparse on the body, more abundant, much shorter and finer on the appendages oblique on the antennal scapes and funiculi, subappressed on the femora and tibiæ.

Head, thorax and pedicel yellowish-brown or testaceous; mandibles, antennæ, gaster and legs, including the coxæ, paler, clearer yellow; mandibular teeth brown.

Redescribed from a single cotype specimen from Mackay, Queensland (Gilbert Turner). As previously suggested, Viehmeyer's *M. overbecki* from Trial Bay, New South Wales, seems to me to be synonymous with the typical form of *abstinens*. The female, which he described very briefly, appears to be very similar to the corresponding caste of the following subspecies.

Mayriella abstinens hackeri subsp. nov.

(Fig. 1, d – e)

Worker. Of the same size and otherwise very similar to the typical *abstinens*, but the promesonotum is slightly narrower and the teeth on the epinotum are distinctly larger, as long as broad and acute, the petiole somewhat shorter, with the anterior slope of the node concave instead of straight in profile, so that it forms a sharper angle with the convex posterior slope.

Head, thorax and petiole more shining and the sculpture of the head and promesonotum distinctly finer, the superimposed rugulosity more delicate, less distinctly longitudinal on the front, with the round foveolæ shallower though more numerous on the head. Postpetiolar node not smooth as in the typical *abstinens* but like the node of the petiole very finely and densely punctulate.

Long, sparse pilosity on the body as in the type, but the hairs on the antennæ and legs distinctly shorter, sparser and appressed.

Color as in the type but the most mature specimens have the gaster concolorous with the head, thorax and pedicel.

Female. Length about 2.7 mm.

Differing from the worker in the following characters: Head fully as broad as long or slightly broader; eyes larger, more than twice as long as broad, with about eight facets in their greatest transverse diameter. Mesonotum as broad as long, narrowed and bluntly pointed anteriorly; scutellum semicircular, flattened; base of epinotum scarcely longer than the declivity, the teeth stouter. Posterior slope of

petiolar node flat, meeting the slightly concave anterior slope at somewhat less than a right angle, the transverse summit formed by their juncture distinctly sinuate in the middle. Postpetiolar node oblong, nearly twice as broad as long.

Reticulate rugosity of head and pronotum much coarser than in the worker, with abundant, deeper, circular foveolæ; mesonotum and scutellum smoother, without reticulate rugules and with smaller and more scattered foveolæ, especially on the anterior and median portion of the mesonotum. Scrobes, pleuræ and epinotum regularly and sharply reticulate-rugulose, or rather coarsely, densely and evenly punctate ("thimble-punctured," to use the French expression) ; petiole and postpetiole less shining and more coarsely punctulate than in the worker. Gaster and legs under a high magnification very finely and superficially shagreened.

Pilosity as in the worker but the long sparse hairs on the body are proportionally shorter and more flexuous and on the gaster more numerous.

Head, thorax and pedicel darker and more ferruginous than in the worker; each ocellus with a round black spot at its inner orbit; posterior border of scutellum and a pair of large elongate parapsidal spots dark brown. Membranes and veins of wings clear and colorless, pterostigma brown.

Described from four workers and six females taken July 20, 1915, by Mr. Henry Hacker near Brisbane, Queensland.

Mayriella abstinens venustula subsp. nov.

Worker. Length 1.3 mm.

Very similar structurally to the typical *abstinens* even in the shape of the epinotal teeth, which though distinctly larger are nevertheless blunt and shorter than their basal diameter. Longitudinal costæ in the mesoëpinotal groove more distinct. Anterior slope of petiolar node slightly concave in profile and therefore more as in the subsp. *hackeri.*

Head, thorax and pedicel less shining owing to the greater sharpness of all four components of the sculpture namely the basal microscopic reticulation or punctulation, the coarser, even thimble-puncturing of the scrobes, neck, pleuræ, epinotum and ventral and lateral surfaces of the

petiole and postpetiole, the superimposed reticulate rugulosity and the foveolation of the head and promesonotum. The rugules are longitudinal only on the anterior expanded portions of the frontal carinæ; the foveolæ are abundant and regularly distributed on the head and anterior half of the promesonotum, its posterior half being thimble-punctured like the epinotum; the nodes of the petiole and postpetiole are more strongly punctulate than in the typical *abstinens* and its subsp. *hackeri*, though more shining than the basal portions of their respective segments.

Pilosity as in the typical *abstinens*.

Head, thorax and pedicel much darker, being dark brown and contrasting sharply with the clear yellow coloration of the mandibles, antennæ, legs and gaster.

Described from a single specimen taken by Mr. A. M. Lea "in rotting leaves" on Mt. Tambourine, Queensland.

Mayriella spinosior sp. nov.
(Fig. 1, f – g)

Worker. Length 1.3 mm.

Of the same size as *abstinens* but differing in the following structural characters: Head broader, fully as broad as long, more rectangular, with somewhat more angular posterior corners, less sinuate posterior border and more widely separated frontal carinæ. Median elevated plate of clypeus shorter, with less developed teeth and more semicircularly excised anterior border. Sides of promesonotum less distinctly submarginate, humoral angles less acute, mesoëpinotal groove shallower and the epinotal teeth replaced by spines which are fully twice as long as their basal diameter, nearly as long as the base of the epinotum and directed upward and outward and somewhat backward. Petiole as long as high, its node in profile truncated above owing to what corresponds to the posterior slope in *abstinens* being angulate in the middle. The anterior border of this truncated area, which is subtrapezoidal and slightly broader behind than in front, is sharply marginate. Postpetiole from above of similar shape but reversed, that is, broader in front than behind, with the anterior corners distinctly produced and bluntly subdentiform. Anterior corners of gaster not marginate.

Mandibles finely longitudinally striate at their external borders. Sculpture of head and promesonotum decidedly coarser than in any of the forms of *abstinens*, consisting of the basal microscopic reticulation overlaid by a regular polygonally reticulate rugosity, without rounded foveolæ in the meshes. The rugæ are distinctly longitudinal on the front of the head. Thimble-punctuation of the scrobes, neck, pleuræ, epinotum and ventral portions of the petiole and postpetiole finer than in *abstinens venustula;* the nodes subopaque, finely and densely punctate.

Pilosity pale yellowish, in length and distribution like that of the subsp. *hackeri.*

Thorax, pedicel and gaster yellowish ferruginous, the head somewhat darker and more brownish; mandibles, antennæ and legs, including the coxæ, brownish yellow; mandibular teeth brown.

Described from a single specimen taken by Mr. A. M. Lea "among fallen leaves" in the Cairns District, Queensland.

THREE WEST INDIAN CARABIDÆ IN FLORIDA

By P. J. Darlington, Jr.

Museum of Comparative Zoölogy, Cambridge, Mass.

Oxydrepanus rufus (Putz.): Of this common Cuban species I took a small series at Homestead, near the southern tip of the mainland of Florida, in June, 1929. They were in floating vegetation in pools, the usual habitat of species of this genus. *O. rufus* is plain rufous, shaped like a Clivina but small as a Dyschirius, 3 mm. or less in length. From both the genera mentioned it differs in having the tips of the apical segments of both pairs of palpi finely produced.

Pseudaptinus (*Thalpius*) *cubanus* (Chd.): one specimen, also from Homestead, June, 1929, was taken in trash beside a flooded pool. It has been compared with a series from Cuba one of which in turn has been compared with Chaudoir's type by Mr. René Oberthür, in whose collection the type now is. The species is easily known by the very dull surface, caused by the fine, very dense punctuation.

Selenophorus discopunctatus Dej. (*chokoloskei* Leng): I have several specimens of this species from Dunedin, Florida, from Mr. W. S. Blatchley. Leng's types were from Chokoloskee and Everglade, Florida. My specimens answer Leng's description perfectly, and at the same time are indistinguishable from our large series of the common *discopunctatus*, which ranges over all the West Indies and much of South America.

Megacephala (Tetracha) affinis angustata Chev. (Coleoptera: Cicindelidæ) North of Mexico

Of this species, not before recorded from the United States, I took four specimens at Brownsville, Texas, June 11 to 16, 1933. They were under street lights at night along the river just above the town, running with numer-

ous specimens of *Tetracha carolina* (L.). My identification has been confirmed by Dr. Walther Horn. *T. angustata* is similar to *carolina* but is obviously more slender, a little less shining, lacks the rosy color at the base of the sutural region, and has the pale apical lunules of the elytra narrower, not distinctly expanded anteriorly. The subspecies has been known previously from Mexico to Costa Rica; the species *affinis* Dej. as a whole ranges to the Argentine.

P. J. Darlington, Jr.

The Males of Certain Priocnemis (Psammocharidæ)

Some twenty years ago in collecting I noted that certain fairly common species of *Priocnemis* were known only from females and that various species of the *Agenia* group were known only from males. I have never found any mating, but from field observations decided that *Agenia pulchrina* Cress. must be the male of *Priocnemis nebulosus* Dahlb. In talking with Mr. Rohwer about it and looking over the collection we concluded that *A. dakota* Cress. was the male of *Priocnemis fulgifrous* Cress. In recent years I have placed the common *Agenia iridipennis* Cress. as the male of the equally common *Priocnemis pompilus* Cress., and that the male of *Priocnemis fortis* Cress. is *Agenia nigripilosa* Cress. There are still some *Priocnemis* and *Agenia* unmatched. This makes it necessary to overlook the presence and absence of tibial teeth as separating the two groups. It, however, is not surprising, as there is much variation in size of the teeth in those males of *Priocnemis* which have teeth; in some cases very small. Moreover in *Pepsis* and in *Hemipepsis* there is often a sexual difference in tibial armature.

Nathan Banks.

Metatrichia in New England (Scenopinidæ)

This genus is not listed in Johnson's New England Diptera nor in the New York State List. It was described by Osten Sacken from Central Missouri. Last summer I took two specimens of *M. bulbosa* O. S. at Holliston, Mass., on the flowers of yarrow, 17 July.

Nathan Banks.

A RARE SPIDER

By Elizabeth B. Bryant

Museum of Comparative Zoölogy, Cambridge, Mass.

Among a collection of spiders from Dallas, Texas, sent to the Museum of Comparative Zoölogy this spring was a small spider which proved to be *Prodidomus rufus* Hentz, a species that has not been found for many years.

Hentz found a single female (?) "in a large box in a dark cellar," August 10th. The arrangement of the eyes was so unusual that he made a new genus for it and placed it near Callopodia (= Hyptiotes). As far as known an adult has never been found since. In the summer of 1891 Mr. Banks found a few immature specimens in a house at Shreveport, Louisiana, and because they were so unusual he described and figured them in the Proc. Ent. Soc. Washington, 1892, 2, p. 259, fig. 12.

In 1918, Compte de Dalmas made a revision of the family Prodidomidæ in the Ann. Soc. Ent. France, 87, pp. 279-340 with numerous figures. He had use of the large collection of M. Simon which contained most of the known species but *Prodidomus rufus* Hentz, the genotype, was known by the very brief original description and the one given by Mr. Banks for the immature specimens. Because of certain discrepancies Dalmas suggests that the two may be separate species. This is probably doubtful because the difference in color can easily be explained by age or general conditions, such as moisture and food and the size of the eyes by the inadequate facilities of lighting and magnification used by naturalists nearly a century ago.

This specimen from Texas is adult and was found out of doors probably on the ground instead of in a house or cellar and the abdomen is only tinged with pink, not red as described by Hentz. It also differs in two characters from others in the genus, the a.m.e. are distinctly the largest of the eight, the fourth trochanter is no longer

than the coxa instead of the longest. These differences would indicate that *Miltia* Simon is a distinct genus as Dalmas suggests.

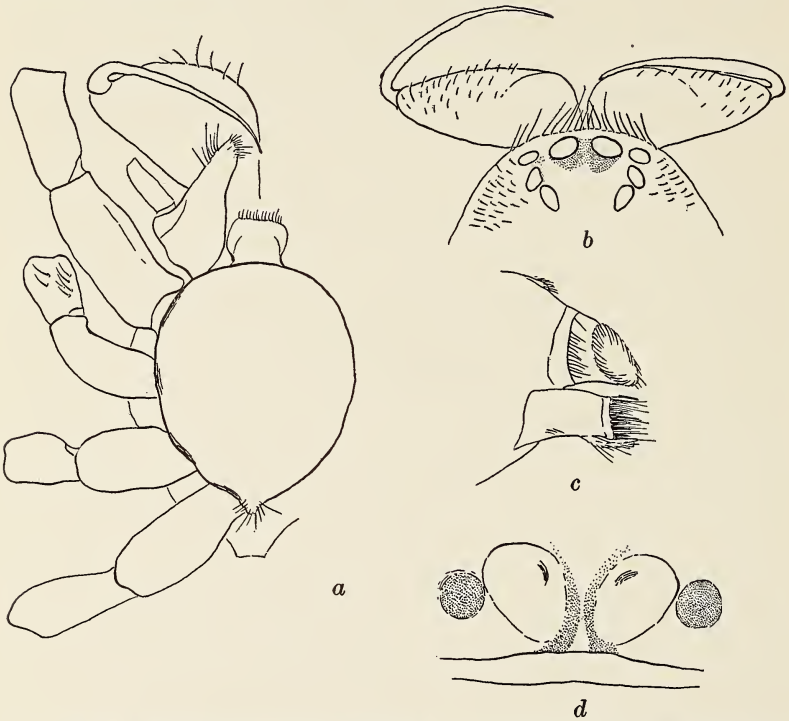

Fig. 1. *Prodidomus rufus* Hentz. *a*, ventral view of carapace; *b*, eyes and cheliceræ; *c*, lateral view of spinnerets; *d*, epigynum.

Prodidomus rufus Hentz (Fig. 1)

Journ. Boston Soc. Nat. Hist., 1847, 5, p. 466, pl. 30, fig. 4; reprint, 1875, p. 105, pl. 12, fig. 4, pl. 18, fig. 9.

♀. 5 mm. long, ceph. 2. mm., abd. 3.1 mm.

Cephalothorax pale yellow, sides with long scattered hairs directed towards the center, rather low and flat, no thoracic groove or separation of cephalic and thoracic portion, sides evenly rounded, anterior margin wider than posterior and slightly rounded; eyes eight, a.m.e. only diurnal, round and dark, other eyes white, flat and angular, anterior row straight by upper margins, a.m.e. largest of the eight,

separated by less than a radius and from a.l.e. by a little more, posterior row so strongly procurved that with the a.l.e., the p.l.e. and p.m.e. form a converging row, p.m.e. widely separated; quadrangle of median eyes narrower in front and higher than wide; clypeus less than diameter of a.m.e., slightly convex with a thin fringe of long hairs on margin; mandibles yellow with stiff colorless hairs, swollen at basal third, and widely divergent, so that fang groove has greater width than the cephalothorax, no boss, fang groove long and poorly defined, no teeth on either margin, fang long, slender and abruptly bent at origin; labium pale yellow, about as long as wide, tip truncate, slightly narrower than base, margins not rebordered, distinct suture between sternum; maxillæ twice as long as labium, origin of pedipalp below middle, distal half much attenuate and slightly inclined over labium; pedipalp lacking claw and terminal joint truncate; sternum pale yellow, darker about margin, smooth, flat and oval, two-thirds as wide as long, widest between second coxæ; ending in a small, obtuse, hairy lobe between fourth coxæ; abdomen pinkish yellow, sparsely covered with long hairs pressed flat, most numerous above the spinnerets, oval, two-thirds as wide as long, rather flat, venter paler and hairs more numerous, impossible to see opening of spirale but probably directly in front of spinnerets; colulus wanting; spinnerets protruding a little beyond the abdomen, inferior pair stout, separated by a diameter, basal joint longer than wide, terminal joint a very slender white tube less than half as long as basal joint, half hidden in a mass of black hairs on the lower side, median pair hidden, superior pair with basal joint reduced to narrow ring, terminal joint slightly smaller with an oblique tip extending a little beyond the inferior pair; anal tubercle conical, surrounded by short black hairs; legs, 4-1-2-3, pale yellow sparsely covered with short black hairs, all coxæ and trochanters can be seen beyond the cephalothorax on dorsal side, trochanters not notched, legs spineless except for a pair of apical ventral spines on IV tibia, only little heavier than bristles with a pair of slender bristles between, two claws without teeth on tarsi, legs not scopulate, I pair legs, coxa longest, three

times as long as wide, trochanter more than half as long as coxa and more slender, femur slightly enlarged and flattened laterally, patella slightly longer than tibia, metatarsus and tarsus equal;

I coxa	+ troch.	fem.	pat.	tib.	metat.	+ tarsus	
1.mm.		1.5mm.	1.mm.	0.9mm.	1.5mm.	=	6.mm.

IV pair of coxæ not as long as I pair and slightly longer than trochanter, very long, slender, crooked trichobothria on IV metatarsus and tarsus (these noted and figured by Mr. Banks); epigynum shows only a transverse slit with a chitinized margin above which are a pair of clear oblique depressed oval areas which in life are thickly covered with hairs and on each side widely separated dark circular sacs beneath the skin that are probably the spermatheca.

Neotype ♀ Texas; Dallas, Bluff View on North West Highway, 16 May 1935. (S. Jones.)

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PSYCHE

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WEST INDIAN CARABIDÆ II.: ITINERARY OF 1934; FORESTS OF HAITI; NEW SPECIES; AND A NEW KEY TO COLPODES*

By P. J. Darlington, Jr.

Museum of Comparative Zoölogy

In this, my second paper on West Indian Carabidæ,[1] are presented the results of a collecting trip to Cuba, Jamaica, and Haiti made between July 28 and November 28, 1934, through a grant from the Milton Fund of Harvard University. I hope to continue this series of papers from time to time as additional material becomes available, and eventually to end it with a complete revision of the Carabidæ of the West Indies, with discussions of their distribution and relationships, of the origin of the faunæ of the isolated mountain ranges, and of other problems.

Itinerary: From August 2 to 12 aided by a small additional grant from the Atkins Fund, I was at the Harvard station at Soledad, near Cienfuegos, Cuba, collecting especially the smaller, more inconspicuous ground insects. On August 13 I arrived in Kingston, Jamaica, and went at once to Whitfield Hall (Miss. G. L. Stedman, office in Kingston) at about 4,500 ft. elevation on the south slope of the main range of the Blue Mts. From here it was easy to climb to fine collecting in the damp cloud forest of Blue Mt. Forest Reserve, and to reach Blue Mt. Peak, 7,388 ft., the highest summit on the island. On August 20 I returned to Kingston and motored across the island to Ocho Rios, on the north coast. Swamp and pond collecting

*The publication of this article has been financed by a grant from the Museum of Comparative Zoölogy.

[1]The first, "New West Indian Carabidæ, with a List of the Cuban Species," appeared in Psyche, Vol. 41, 1934, pp. 66-131.

proved to be good, especially at Bogue, a large coconut plantation. Castle Daly (August 24-25, as the guest of Mr. Robert W. Bell) and Moneague Lake (August 25-26) proved, entomologically, rather disappointing. On the 26th I returned to Kingston, staying at Mona Great House, near Hope Gardens, and spent the next three days working the Liguanea Plain and nearby country. Ground beetles were unexpectedly numerous. A trip (afternoon of August 29) to the Rio Cobre at a point about 5 miles above Spanishtown, and to the swamps beside the main road from Kingston to Spanishtown, resulted in an especially fine collection.

On August 30 I reached Haiti, meeting Dr. Marston Bates at Port-au-Prince, where we made our headquarters at the Sans Souci Hotel. After several days of delay, spent partly in collecting in the Cul de Sac region, we drove in a 1927 Buick roadster into northern Haiti. From September 5 to 11 we were at Ennery, about 1,000 ft. altitude, working especially along the fine little river near the town. On September 9 we made a rather hasty side trip to Mt. Basil, probably the highest mountain in northern Haiti, and found several fine, new mountain Carabidæ in patches of very wet, low cloud forest on the summit plateau, about 4,700 ft. Engine trouble forced us to return to Port-au-Prince on September 11. We broke the drive south long enough for me to spend a very profitable four hours along the edge of the extensive swamps north of Dessalines.

While our car was garaged, we persuaded Mr. André Audant, government entomologist of Haiti, to join us in a miniature "safari" to the neighborhood of La Visite, on the western end of the main range of La Selle, south of Port-au-Prince. Our schedule was arranged to the last detail through the good offices of Captain Frederick Baker, whose knowledge of the country and country people is unsurpassed. We were away from September 16 to 23, making our base camp in tall pine forest at over 6,000 ft., beside the small river called by the local Negroes the Rivière Blanche, but referred to by Wetmore[2] as the Rivière

[2]Birds of Haiti and the Dominican Republic, by Alexander Wetmore and Bradshaw H. Swales, Bulletin 155, United States National Museum, 1931.

Chotard. This stream flows south, and cannot be the north-flowing Rivière Blanche of the map.[3] We used Wetmore's actual camp site (*l. c.*, Plate 9). Ground collecting in the wet cloud forest was exceedingly good, but the pine forest, under which the ground cover had been burned, was barren.

Back at Port-au-Prince, we found ourselves unable to afford further auto travel, and Dr. Bates was forced to leave for Panamá. After several days of delay, during which, through the great kindness of Dr. H. D. Barker, I was able to make auto trips to about 2,000 ft. in the foothills of the La Selle massif above Port-au-Prince (October 2), to the Rivière Froide about 6 miles south of the city (October 3), and to Poste Terre Rouge, 2,000 ft., in the mountains just north of the Cul de Sac (October 5), I left by public bus for Aux Cayes, on the southwestern peninsula of Haiti. From Aux Cayes I hired a car inland to Camp Perrin, which I reached October 8. Two days sufficed to pacify the local authorities and hire porters, and the next 16 days were spent on foot in the maze of wet ranges which constitute the Massif de la Hotte. Our route lay first north from Camp Perrin along the narrow, new road, impassable for cars in rainy weather, which crosses the foothills toward Jérémie, then west by vile foot trails, and finally north to Desbarrière (about 4,000 ft.), on a spur which curves down first north and then west from the northern slope of La Hotte itself. From Desbarrière, October 13, with a local man as guide, I ascended the ridge to above Roche Croix (a prominent rock marked with a rude natural cross), to about 5,000 ft., and found, beside new beetles, a new genus of snake and a new lizard of a genus previously known only from Jamaica. Further advance by way of the long ridge proved impracticable—the ground was covered with treacherous limestone formations hidden under deep moss and bracken—so we packed and moved from Desbarrière down a thousand feet or so to Tardieu (pronounced more like "Targi" by the inhabitants) in the valley of the turbulent Rivière Tardieu, be-

[3]We used the *Carte de la Republique d'Haiti*, issued by the *Direction Generale des Travaux Publics*, Port-au-Prince, 1928.

tween the ridge of Desbarrière and the north slope of La Hotte. From Tardieu I ascended the main peak (Pic de Macaya on the map, but called merely "La Hotte" locally; 7,800 ft. or a little less), taking four days (October 15-18) for the climb and descent. I spent an exceedingly cold night on top, with no cover except a leather jacket, and encountered various difficulties of no particular scientific interest. The climax of the ascent was partly spoiled by the discovery that surveyors had been up two or three years before, cutting a temporary trail from the other side, and had felled an acre or two of the big pines on the highest point to make room for surveying targets, but my catch of ground insects was more than satisfactory. From October 19 to 22 our departure from Tardieu was blocked by the river, flooded by heavy rains; then two days of steady walking took us back to Camp Perrin. On October 26 and again on the 27th I collected along the shores of Etang Lachaux, a fine, small lake an hour's walk over a ridge east of Camp Perrin. This was perhaps the best single locality I found below 1,000 ft. for ground collecting. Miragoane (October 30 to November 2), on the other hand, proved to be about the worst, in spite of the extensive swamps along the lake shore. On November 2 I reached Port-au-Prince again. Four days later an attack of malaria forced me to go up to Kenskoff, above the city, on one of the outer ridges of the Massif de la Selle, at about 4,500 ft., to rest and recuperate in the cool climate. I did a little collecting in the neighborhood, from about 4,000 ft. to Morne Tranchant, about 6,000, directly above Kenskoff. From November 15 to 20, after returning to Port-au-Prince, I made a very unprofitable trip to Manneville, at the western end of Etang Saumâtre, and to swampy Trou Caïman nearby, and an equally unprofitable ascent of Mt. Trou d'Eau (about 5,200 ft.). This is the highest Haitian peak just north of the Cul de Sac, near Thomazeau. On November 22 I sailed from Port-au-Prince for New York.

Present Forests of Haiti: Four centuries of occupation by a large population of Negro peasants (according to the *World Almanac* there are about 2,550,000 people in the country to-day, or about 250 per square mile) have left no

real forest at low altitude in Haiti, nothing better than cactus and acacia scrub and dry, open woodland, and even these exist only where fresh water is not available for humans. A single exception should perhaps be made of the tip of the southwestern (Tiberon) peninsula, near Dame Marie. Here, according to Dr. Barker, who has seen the region from the air, good forest seems to be continuous from the westernmost ranges of the Massif de la Hotte down almost to sea level. The vegetation indicates a local rainfall of nearly 200 inches a year. With this exception, all the wet forest of Haiti (I am speaking of the country, not the island, for I do not know Santo Domingo) is now confined to the mountains.

The mountains of the country of Haiti form three natural geographical divisions. Each division has its own distinctive ground fauna, found as a rule only in the remnants of cloud forest at high altitudes. Almost all of the true mountain species and even some of the genera are restricted to a single one of these divisions. This is true not only of the insects but of the lizards, frogs, mollusks, Peripatus, etc. as well. The mountains of the northern part of Haiti, north of the Cul de Sac, may probably be considered faunistically as a single division (*Division I.*). They are relatively low and accessible, and what little forest is left on them is confined to the summits of a very few ranges. The sooner these mountains are thoroughly explored zoölogically, the better, for some forest species have probably already become extinct, and others will follow. On the plateau of Mt. Basil (4,700 ft.), to which we climbed from the road between Ennery and St. Michel de l'Atalaye, there is still a good deal of low, dense, wet cloud forest. The plateau is rough and there is no permanent drinking water, and the Negroes do not like the cold at that altitude, but even so they climb up daily and are gradually clearing the best growth to plant vegetables. In 1928 there were some patches of much better cloud forest on Haut Piton (about 3,900 ft.), near Port-de-Paix, according to Mr. James Bond, who climbed the mountain on an ornithological reconnaissance, but they were rapidly being destroyed at that time. There is also a small area of forest on Puilboreau, just north of Ennery, but it is said to be

on a slope, and much drier than the plateau forests. I have not been able to learn definitely of any other good forest in the North, although a little may still exist on other isolated ranges. The summit of Morne Ṣalnave (NW. Haiti) is said to be covered with low, scrubby second growth (Bond). The conditions I found on Mt. Trou d'Eau (5,200 ft.) are probably typical of most of the more accessible peaks: very dry, rather open woods on the lower slopes; pastures and gardens above, where the soil is better, right up to the summit, which was crowned by a corn field.

South of the Cul de Sac, which forms a perfect barrier to mountain animals, the mountains are higher and wetter, and there are still large areas of forest. This is the case on the Massif de la Selle (*Division II.*), or at least on the plateau of the main range, where there are extensive pine woods as well as long strips of dense, low cloud forest. The cloud forest, under which the soil is black and rich, is being attacked by Negro farmers, who have pushed their gardens in places up to 7,000 ft., but it will probably be many years before it is all destroyed. The pine woods will probably last even longer, for the soil is poor, but unfortunately, at least on the western end of the range, which was all we saw, they have been marred by repeated burning of the ground vegetation under the trees. Some of the outlying ridges, too, of this massif, have evidently supported both pine and cloud forest in the past, but for the most part, as on Morne Tranchant above Kenskoff, the trees have all been cut and the mountain fauna persists, if at all, only in damp thickets and gullies. There is, however, some good cloud forest left in the Crête à Piquant (western) section of the La Selle massif (Bond).

West of the higher ranges of the Massif de la Selle, for perhaps 60 miles along the narrow middle part of the peninsula, lie a series of lower ridges without notable peaks. These, as can be seen from the road, are mostly either stripped or so dry as never to have been heavily forested. The latter is probably the case, for the ground life of the La Hotte mountain complex (*Division III.*) at the outer end of the peninsula has evidently long been isolated from that of La Selle. First of the important western mountains is Bonnet Carré, between Aquin and L'Asile, a broad

dome a little over 4,000 ft. high. Seen from La Hotte, this mountain seems still to be capped with at least a square mile of dark forest. It is entirely unknown entomologically. Botanically it is related to La Hotte, but with some peculiar forms. Between Bonnet Carré and the easternmost rainforest (at about 2,000 ft.) on La Hotte there are 20 miles or more of low, dry ridges. The high ranges of the central part of the La Hotte massif (Pic de Macaya, Pic du Formon, and Pic de la Gde. Colline on the map), and apparently also most of the lower ranges to the west almost to the coast, are very heavily forested. On La Hotte itself is a completely unbroken tract, without even trails, probably 8 or 10 miles across the narrowest way. The forest is of two kinds: fine pine with unusually thick undergrowth and with thick moss and pine needles on the ground, and lower, denser, very wet cloud forest, without pine, fringed with cutting climbing bamboo and other atrocious plants. It is in the La Hotte region, of all Haiti, that there is to-day the best chance of finding novel forms of life, and it is undoubtedly there that natural conditions will persist longest.

DESCRIPTIONS: Wherever in the following pages definite proportions are given—for instance the relative width of head and prothorax—they are based on actual measurements made under a binocular microscope. Estimates made without measuring are likely to be surprisingly inaccurate. I have invariably measured the width of the head across the eyes at the widest point; width of prothorax, at widest point; length of prothorax, at middle, regardless of whether or not the anterior angles project forward; width of base of prothorax, between angles; width of apex, between most advanced points of angles.

Ardistomus alticola n. sp.

Very stout and convex; black, shining but not metallic; not spotted; legs piceous; antennæ, palpi, and tarsi rufous. *Head* with front margin of clypeus faintly convex; front lightly, vertex not distinctly transversely impressed. *Prothorax* suborbicular, moderately narrowed in front; lateral margins distinct to base; disk with usual fine middle line and anterior transverse impression; not punctate. *Elytra*

broad and convex; humeri rounded; striæ deep, impunctate, entire and strong at apex, 2nd as well as others entire at base; short accessory stria at extreme base close to suture; 3rd stria running to humeral margin; intervals convex, shining, 3rd with 5 setigerous punctures; trace of alutaceous microsculpture at extreme base of elytra. Last ventral with 2 setigerous punctures each side near margin. Front tibia with 1 strong and 1 weak tooth on outer side above terminal digit; front tarsi rather widely dilated. Length 4.7; width 1.8 mm.

HAITI: holotype (M. C. Z. no. 22012) and 1 paratype from Mt. Bourette, La Selle massif, 5,000 ft., Sept. 16 & 23; under mossy stones in a damp gully.

Very similar to *A. lævistriatus* F. & S. of Guadeloupe (I have 1 specimen borrowed from the U. S. N. M.) but the prothorax of the Haitian species is less inflated at sides below the margin, and the 2nd elytral stria is not abbreviated basally as it is in *lævistriatus*. Moreover the latter lacks scutellar striæ and is much more alutaceous across the base of the elytra. The striæ of the elytra are deeper at apex in the Haitian species.

Tachys (Tachyta) noctis n. sp.

Form average for Tachyta, rather parallel and subdepressed, but head smaller than usual; black, appendages, mouth parts, and lateral margins of prothorax and (less distinctly) of elytra testaceous; upper surface entirely moderately alutaceous. *Head* 2/3 width prothorax; eyes only slightly prominent; front with usual 2 weak impressions; antennæ short, 2nd and 3rd joints subequal, outer ones (except apical) moniliform; mentum not biperforate, toothed at middle. *Prothorax* 2/5 or slightly less wider than long; sides slightly rounded anteriorly, approximately straight before the posterior angles (sometimes minutely, faintly sinuate); posterior angles nearly right; fine but distinct costa each side from base for 1/3 of length within (not on) margin; lateral margins translucent, evenly explanate from base to apex, as wide or wider than in *T. flavicauda;* middle line and basal transverse impression well marked, anterior impression very faint. *Elytra* only slightly depressed; each about 6-striate (7th and 8th striæ

barely detectable), inner striæ strongly impressed, outer shallower, all except sutural slightly abbreviated at extreme apex; apical stria recurved as usual; outer edge 3rd interval with setigerous punctures just before middle and ¼ from apex. Two basal joints ♂ front tarsus dilated, with anterior apical angles somewhat produced. Length 2.25-2.5; width 1.0 mm. (slightly more or less).

HAITI: holotype (M. C. Z. no. 22014) and 4 paratypes from Roche Croix, Massif de la Hotte, 5,000 ft., Oct. 13; 3 paratypes from northeastern foothills La Hotte, Oct 10-24; under bark.

Resembles in color the description of *marginicollis* Schaum (now called *neotropicus* Csiki) of Venezuela except that the appendages, of *noctis*, are testaceous (not rufopiceous), with femora not infuscate. The elytra are described as bistriate in *marginicollis;* there are numerous striæ in *noctis*.

Tachys (Tachyura) tritax n. sp.

Form average for subgenus, convex; piceous, not distinctly spotted, shining, moderately iridescent; appendages and mouth parts testaceous. *Head* about ¾ width prothorax, eyes prominent; front shining, briefly bi-impressed anteriorly; antennæ moderate, middle joints about ½ longer than wide; mentum not biperforate, toothed at middle. *Prothorax* about ½ wider than long, sides strongly arcuate anteriorly, slightly sinuate before the obtuse but not blunted basal angles; latter briefly carinate; side margins narrow; basal transverse impression deep, punctulate, but not distinctly foveate; middle line very fine, anterior impression nearly obsolete. *Elytra* each 3-striate; sutural stria entire and recurved as usual, 2nd abbreviated about 1/6 from base and apex, 3rd extending from anterior puncture (about 1/3 from base) to slightly behind posterior puncture (about 1/3 from apex), all 3 striæ well impressed. Male with 2 basal joints each front tarsus slightly dilated, with anterior apical angles slightly produced. Length 2.2-2.7; width 1.0-1.1 mm.

HAITI: holotype ♂ (M. C. Z. no. 22015) and 5 paratypes from Camp Perrin, Oct. 8-27; 10 paratypes from Trou Caïman, Nov. 15-20; 1 paratype from Ennery, Sept. 6; 2

paratypes from Mt. Trou d'Eau, 4,000 ft., Nov. 19; most taken beside temporary muddy pools in roads.

In Hayward's key to the North American species of Tachyura (Trans. American Ent. Soc. 26, 1899, pp. 202-), *tritax* runs to *incurvus* Say, agreeing in general form and in the structure of the basal transverse groove of the prothorax, but *incurvus* is spotted and has only a sutural stria on each elytron. Most of the known Central American species of this group have the basal groove strongly tri- or uni-foveate at middle, and none has other characters as in *tritax*. The striation of the elytra in the latter is remarkable for its constancy.

Tachys (s. s.) carib n. sp.

Moderately broad and depressed; rather shining testaceous or brownish testaceous, head darker, iridescence faint. *Head* about 2/3 width prothorax, but with eyes prominent, forming nearly right angles with sides of head behind them; antennæ with middle joints ½ or slightly more longer than wide; front with usual 2 rather shallow subparallel impressions; mentum biperforate and toothed. *Prothorax* about 3/5 wider than long; sides more or less strongly sinuate just before the right (but finely blunted) posterior angles; disk with usual impressions. *Elytra* rather broadly oval; humeri rounded but distinct; each elytron with about 3 inner striæ more or less impressed except at apex, outer striæ faint or absent; anterior dorsal puncture almost on 4th stria 1/3 from base, posterior within hooked tip of recurved striole. Male with 2 basal joints each front tarsus narrowly dilated. Length 1.8-2.2; width 0.8-0.9 mm.

HAITI, CUBA, JAMAICA, PUERTO RICO: holotype ♂ (M. C. Z. no. 22017) and 95 paratypes from Ennery, Haiti, Sept. 6-11; additional paratypes from Haiti as follows: 7, northeastern foothills La Hotte, 2000-4000 ft., Oct. 10-24; 10, Camp Perrin, Oct. 8-27; 1, Rivière Froide, Oct. 3. Also the following specimens, not types: Cuba: 23, Soledad, near Cienfuegos, Aug. 2-12; Jamaica: 1, Rio Cobre, 5 mi. above Spanishtown, Aug. 9; 1, Blue Mts., about 4,500 ft., Aug. 13-20. All specimens taken by myself by washing out gravel bars, piles of stones, and trash by clear, running

brooks and rivers. Also Puerto Rico: 2, Serralles Finca, Ponce, June 5, 1934, R. G. Oakley (U. S. N. M.).

In my key (*l. c.*) this runs to *Tachys abruptus* Darl., but *carib* is much smaller, with sides of prothorax more sinuate basally and dilated joints of ♂ front tarsi much narrower.

Tachys trechulus n. sp.

Convex, rather ventricose, but otherwise of normal Tachys (*s. s.*) form; piceous or rufo-piceous, with sericeous lustre but scarcely distinct iridescence; appendages brownish testaceous, antennæ darker in basal ½. *Head* about 7/10 width prothorax, narrow and with elongate mandibles; eyes only slightly prominent; frontal sulci narrow, subparallel; antennæ moderate in length but with unusually long and conspicuous setæ, middle joints about ½ longer than wide; mentum biperforate and toothed. *Prothorax* just over 1/3 wider than long; sides arcuate anteriorly, straight posteriorly, very faintly sinuate before the obtuse, finely blunted posterior angles; base somewhat oblique at sides; disk convex; basal transverse and median longitudinal grooves fine, anterior transverse impression obsolete. *Elytra* oval, very convex, with narrowed, rounded humeri; each with entire sutural stria recurved as usual and several additional striæ faintly indicated on disk; anterior dorsal puncture on 4th interval about 1/3 from base, posterior within hooked tip of recurved striole. Inner wings vestigial, strap-like, about 2/5 length of elytra. Two basal joints ♂ front tarsus moderately dilated, with anterior apical angles produced. Length 2.6; width 1.2 mm.

JAMAICA: holotype ♂ (M. C. Z. no. 22018) and 1 ♀ paratype from Blue Mt. Forest Reserve, main range Blue Mts., 5,000-7,000 ft., Aug. 17-19; under deeply buried stones in damp forest.

Unique, among the Tachys (*s. s.*) with 2 joints each ♂ front tarsus dilated, in the atrophied wings and (consequently) ventricose elytra.

Perileptus dentifer n. sp.

Elongate, depressed; rufo-testaceous to brownish piceous, legs paler, antennæ scarcely so; upper surface pubescent

as usual. *Head* barely narrower than prothorax by measurement, appearing at least as wide; eyes very prominent; temples very briefly subparallel behind eyes; front shining, lightly punctate; antennæ slender, middle joints 3½-4 times long as wide; mentum toothed as usual. *Prothorax* cordate, ¼ or less wider than long; least width *before* basal angles slightly less than 2/3 greatest width; sides very strongly sinuate before basal angles; latter very acute, directed almost laterally; sides of base oblique or somewhat emarginate near angles; lateral margins entire, normal, more or less crenate posteriorly; disk finely, moderately closely (not densely) punctate; impressions as usual. *Elytra* rather finely and closely punctate; sutural stria entire except at base, 2 or 3 other striæ faintly indicated, 3rd 3-punctate as usual. Male with 2 basal joints each front tarsus moderately dilated. Length 2.7-3.3; width 0.9-1.1 mm.

HAITI and PUERTO RICO: holotype ♂ (M. C. Z. no. 22019) and 43 paratypes from Ennery, Haiti, Sept. 6-11. Also the following specimens, not types: Haiti: 2, Rivière Froide, Oct. 3; 11, Camp Perrin, Oct. 8-27; 5, northeastern foothills La Hotte, 2,000-4,000 ft., Oct. 10-24; Puerto Rico: 2, Serralles Finca, Ponce, June 5, 1934, R. G. Oakley (U. S. N. M.). All my specimens were taken in gravel beside swift, clear streams.

Similar to the previously know West Indian Perileptus (*cf.* Darlington, *Psyche* 41, 1934, pp. 86-88) and like them a member of the *areolatus* group, but easily known by the very acute posterior prothoracic angles.

Perileptus minutus n. sp.

Slender, depressed; testaceous or rufo-testaceous, rather shining; pubescence as usual. *Head* barely narrower than prothorax; eyes prominent; temples very briefly subparallel behind eyes; front obsoletely punctate, shining; antennæ relatively stout, middle joints 2-2½ times long as wide; mentum toothed. *Prothorax* subcordate, about 1/8 wider than long, sides narrowed, sinuate, and then subparallel before right posterior angles; latter not truly basal, set slightly forward from the base so that prothorax is very briefly pedunculate; width across basal angles 2/3

or slightly more greatest width; width basal peduncle ½ greatest width; side margins narrow, entire, slightly crenate basally; disk with usual impressions, finely, not densely punctate. *Elytra* rather closely punctate, punctures relatively much coarser than in other American Perileptus, sutural stria entire except at base, other striæ scarcely indicated; usual 3 setigerous punctures on position of 3rd stria about 1/5 from base, behind middle, and about 1/10 from apex. Male with 2 basal joints each front tarsus dilated as usual. Length 1.8-1.9; width about 0.5 mm.

JAMAICA and HAITI: holotype ♂ (M. C. Z. no. 22020) and 1 ♀ paratype from Rio Cobre, 5 mi. above Spanishtown, Jamaica, Aug. 29; 1 ♀ paratype from Ennery, Haiti, Sept. 6; all washed from bars of river gravel.

Also a member of the *areolatus* group of Perileptus, but very distinct within the group because of its small size, rather stout antennæ, relatively coarsely punctate elytra, and subpedunculate prothorax.

Dyschromus tiburonicus n. sp.

Form average; dull black with a brownish, purplish cast especially on the elytra; mouth parts and appendages brownish to piceous. *Head* about 2/3 width prothorax; eyes moderate; front dull but not punctate, with 2 short impressions between anterior edges of eyes; vertex lightly transversely impressed; antennæ as usual in genus; mentum with short, emarginate tooth; labial palpi both sexes with apical joint very broadly triangular, apex nearly as wide as inner side in ♂; apical joint maxillary palpi slender, narrowly truncate. *Prothorax* about 1/3 wider than long, slightly narrowed behind; sides straight or very broadly and slightly sinuate before right or slightly obtuse basal angles; base and apex not margined, side margins narrow, each with a seta 1/3 from apex and at basal angle; disk rather flat basally, more finely alutaceous than head, not punctate; transverse impressions rather vague; middle line fine but well impressed except at base and apex; basal foveæ linear, about 1/3 length prothorax, scarcely nearer sides than middle. *Elytra* convex, opaque; striæ entire, moderately impressed, impunctate except for a strong punc-

ture almost at base 2nd stria; first stria sometimes briefly obliterated near base, leaving 1 or 2 punctiform or linear impressions basally; intervals slightly convex, not irregular nor interrupted. Abdomen with last 3 segments transversely grooved at base as usual, grooves subcrenate laterally; prosternal process strongly margined; mesepisternum with a cluster of punctures near middle, lower surface otherwise impunctate. Male with anterior tarsi moderately dilated, 4 joints of each biseriately squammulose. Length 10.5-11.5; width 4.1-4.6 mm.

HAITI: holotype ♂ (M. C. Z. no. 22021) and 3 ♀ paratypes from northeastern foothills La Hotte, 2,000-4,000 ft., Oct. 10-24; 1 ♂ paratype from north slope La Hotte itself, 5,000 ft., Oct. 18; all under stones and logs in damp woods and coffee plantations.

This species is very distinct from the two Dyschromus previously known from Haiti (*opacus* Chd. and *cupripennis* Chd.), both of which we possess, in having the elytra with impressed striæ and regular intervals. It is perhaps more like the Mexican *chrysophanus* Bates, known to me only by description, but the latter has an unmargined prosternal process and probably has shallower elytral striæ.

Loxandrus mutans n. sp.

Rather slender and subparallel, not much depressed; black; antennæ (especially basally), mouth parts and tarsi brownish testaceous; lower surface and legs brownish or rufo-piceous; head and prothorax moderately shining, elytra dull, alutaceous in both sexes, but especially so in ♀. *Head* about ¾ width prothorax; mentum tooth broad, subtruncate apically, slightly impressed along middle. *Prothorax* about ¼ wider than long; sides slightly to moderately arcuate anteriorly, moderately narrowed and sinuate posteriorly before right posterior angles; margins very narrow, evenly reflexed; disk moderately convex; middle line fine but distinct except at base and apex; transverse impressions subobsolete; fine anterior submarginal line widely interrupted at middle; basal foveæ linear, rather deep, at least 1/3 length prothorax; surface impunctate except vaguely punctate at middle near base. *Elytra* narrow and not much depressed, alutaceous, with fine, entire, mod-

erately impressed, finely punctulate striæ; inner intervals slightly convex, outer nearly flat; single dorsal puncture on inner side 3rd interval near middle. Metepisterna about twice as long as wide, narrowed posteriorly. Hind tarsi sulcate both sides above; 5th tarsal joint with about 3 setæ each side below. Male anterior tarsi each with first 3 joints conspicuously dilated and oblique. Length 8-9; width 2.7-3.3 mm.

HAITI: holotype ♂ (M. C. Z. no. 22022) and 19 paratypes from Etang Lachaux, Oct. 26-27; 10 paratypes from swamps north of Dessalines, Sept. 11; 1 paratype from Damien, near Port-au-Prince, A. Audant collector. My specimens were taken under trash and in loose soil a little above water level beside standing water.

This species belongs to a small group of Loxandrus characterized by the elytra being opaque, especially in the ♀. From *opaculus* Bates of Brazil, *mutans* differs in having the body piceous, not clear red, below; from *sculptilis* Bates of Mexico and Panama, in having the sides of the prothorax sinuate posteriorly. Both Bates' species are unfortunately known to me only by description.

COLPODES M'LEAY

In my first West Indian paper (pp. 92-93) I gave a key to the 15 insular species of Colpodes then known. Aquisition of more material has now more than doubled the number of species, so that a new key is necessary. In composing it, I have avoided as much as possible using the form of the metepisterna as a character, for its use results in a very unnatural classification, full of borderline species, and very difficult to use. In deference to the past classifications of Chaudoir and Bates, however, I have arranged the couplets in such a way that all species the *names* of which occur in the key up to and including couplet 21 have the metepisterna with outer edge (not including the posterior lobe which overlaps the first ventral) *not longer* by measurement than 1½ times the length of the anterior edge. These species would fall in Chaudoir's groups I or II in his 1878 revision (Ann. Soc. Ent. France (5) 8, pp. 278-382). Species *named* in couplet 22 or below have the metepisterna with outer edge *not less* than 1½ times the anterior, and

would fall in Chaudoir's group III. No additional material has been secured from the Lesser Antilles, where there are still 3 species recorded which are unknown to me, so the following key has been constructed to cover only the species of the Greater Antilles. In this region there is now only one described species which I do not know, *C.* (*Metallosomus*) *cuprascens* Mots. (Bull. Soc. Nat. Moscou 37, 1864, no. 4, p. 305), described from "St. Domingue aux Antilles." The description is superficial, but the species is evidently very different from any I have seen.

With the exception of the widely ranging *C. æquinoctialis* Chd., I know of no Colpodes which occurs either on the Greater Antilles and the mainland (I have seen at least half the known Central American species), the Greater and Lesser Antilles, any two of the greater islands, or even upon any two separate mountain ranges on a single island. They are evidently so local that I feel safe in describing West Indian species without discussing their relationship individually with the continental fauna.

Key to Greater Antillean Colpodes (*excepting cuprascens Mots.*)

1. Tibiæ finely sulcate along extreme outer edge; tarsi strongly trisulcate above .....27.
   Tibiæ not sulcate on outer edge; tarsi with not more than 2 sulci above .....2.
2. One or more supra-ocular and/or lateral thoracic setæ missing; Jamaican species .....3.
   Two supra-orbital and 2 lateral thoracic setæ each side; species not on Jamaica, except for the widely distributed *æquinoctialis* .....8.
3. Two supra-ocular setæ each side .....4.
   One supra-ocular seta (the anterior) missing .....5.
4. Anterior lateral thoracic seta present, posterior missing; elytra much duller than head and prothorax... *cinchonæ* Darl.
   Anterior seta missing, posterior present; elytra not duller than head and prothorax; (metepisterna much more elongate) .....22.

5. Anterior thoracic seta present, posterior missing; elytral striæ subcrenulate ..... *faber n. sp.*
   Anterior seta absent, posterior present; elytral striæ smooth ..... 6.
6. Broad, prothorax about 1/3 wider than long ..... *vagepunctatus* Darl.
   Slender, prothorax as wide as to 1/10 wider than long 7.
7. Elytra normal; prothorax more subquadrate, posterior angles obtuse, narrowly rounded ..... *macer* Darl.
   Elytra oval, subventricose; prothorax oval with very broadly rounded posterior angles .... *subovalis* n. sp.
8. Length 6-8 mm.; form very Agonum-like ..... 9.
   Size larger ..... 10.
9. Sides of prothorax not sinuate; elytral striæ relatively shallower ..... *agonellus* n. sp.
   Sides of prothorax sinuate before base; striæ deeper.. *pavens* n. sp.
10. Posterior marginal seta on each side of prothorax about 1/10 prothoracic length before basal angles; elytra duller than head and prothorax ..... 11.
    Said seta on or not more than 1/20 before basal angles; elytra not duller than head and prothorax ..... 13.
11. Eyes small, scarcely more prominent than genæ; prothorax not margined at middle anteriorly..... *marcus* n. sp.
    Eyes larger, much more prominent than genæ; prothorax with fine, entire anterior margin ..... 12.
12. Elytral striæ moderately fine; ♂ hind trochanters 1/3 length femora, unmodified ..... *amone* n. sp.
    Striæ extremely fine and superficial; ♂ hind trochanters 2/5-½ length femora, bluntly pointed ..... *wolla* n. sp.
13. Hind tarsi with 4th joint emarginate, outer lobe formed about like inner and not much longer; habits not riparian ..... 14.
    Hind tarsi with 4th joint emarginate, outer lobe much longer than inner; species associated with running water ..... 26.
14. Elytral striæ interrupted ..... 23.
    Elytral striæ (except rarely the outer ones) not interrupted ..... 15.

15. Prothorax not narrowed basally, base broad as middle ..... 24.
    Prothorax more or less narrowed basally ..... 16.
16. Metepisterna with outer edge not over ½ longer than anterior ..... 17.
    Outer edge metepisterna about 2 × length anterior edge ..... 25.
17. Head relatively small, less than 2/3 width prothorax, genæ not prominent, oblique, barely convex in profile; mentum tooth finely pointed (northern Haiti) 18.
    Head larger, about 7/10 or more width prothorax, genæ convex and prominent; mentum tooth blunt or emarginate (southern Haiti) ..... 19.
18. Prothorax subquadrate with posterior angles almost right; not margined at middle anteriorly; ♂ posterior trochanters acuminate, 3/5 length femora ..... *christophe* n. sp.
    Prothorax with sides much rounded and posterior angles obtuse; anterior margin fine but entire; ♂ posterior trochanters probably not acuminate ..... *cychrinus* n. sp.
19. More slender and depressed; prothorax finely margined anteriorly (see also under description) (La Hotte) .. *constricticeps* n. sp.
    Stouter; prothorax not margined at middle anteriorly (La Selle) ..... 20.
20. Larger and broader, with head relatively narrower; margins of prothorax moderately to broadly explanate ..... 21.
    Slightly smaller and narrower, head relatively broader; margins of prothorax rather narrowly explanate (see description for final identification) .... *tipoto* n. sp.
21. Prothorax subquadrate, base ¼ or more wider than apex, margins moderately explanate; posterior dorsal puncture of elytra present ..... *jægeri* Dej.
    Prothorax subcordate, base 1/10 to 1/7 wider than apex, sides rather widely explanate; posterior elytral puncture missing ..... *subcordens* n. sp.
22. Brown; external elytral striæ punctulate. *punctus* n. sp.
    Bluish purple; striæ not punctulate..... *bruesi* n. sp.
23. (No alternative) ..... *fractilinea* Darl.

24. (No alternative) ..... *visitor* n. sp.
25. (No alternative) ..... *baragua* n. sp.
26. Elytra bluish or greenish, striæ not interrupted..... *æquinoctialis* Chd.

    Elytra not metallic, striæ interrupted. *altifluminis* n. sp.
27. (No alternative) ..... *latelytra* n. sp.

Colpodes faber n. sp.

Elongate, moderately convex; brownish piceous, lower surface and appendages rufescent; not strongly shining, but elytra not much duller than head and prothorax. *Head* large, 4/5 or slightly more width prothorax; eyes not prominent, genæ only slightly converging posteriorly; neck very wide, slightly narrower than genæ; anterior supra-ocular seta missing; antennæ short, not reaching much beyond base prothorax; mentum tooth blunt at apex. *Prothorax* subcordate, about ¼ wider than long; base squarely truncate, about equal to or a trifle narrower than apex; sides broadly, not strongly arcuate in anterior ¾, moderately strongly sinuate before the right but finely blunted posterior angles, margins rather broadly explanate for such a slender species, posterior marginal seta missing; base and apex finely margined, latter sometimes rather indistinctly so; disk with usual impressions; basal foveæ deep, not sharply defined, each with an impressed area extending forward parallel to margin almost to apex, not punctate. *Elytra* slightly (¼-3/10) wider than prothorax, rather elongate, widest about 1/3 from apex; humeri distinct; sides slightly converging anteriorly, faintly sinuate 1/5 or 1/6 from base and before apices, which are rather broadly, subindependently rounded; disk moderately convex; striæ well impressed, rather coarsely punctate or subcrenate, with individual punctures not well defined; intervals convex, 3rd either without visible dorsal punctures or with single one at or behind middle. Metepisterna with outer edge slightly longer than anterior, not or only faintly margined at sides; body impunctate below. Tibiæ not grooved on outer edge; hind tarsi not or indistinctly grooved above, 4th joint emarginate, outer lobe very slightly longer than inner; front tarsi not grooved above. Length 11.5-13; width 3.7-3.8 mm.

JAMAICA: holotype (M. C. Z. no. 21992) and 3 paratypes from Blue Mt. Forest Reserve (main range Blue Mts.), 5,000-6,000 ft., Aug. 17-19, 1934; under stones and chips in wet forest. Unfortunately all are ♀ ♀. The species is very isolated, taxonomically.

Colpodes subovalis n. sp.

Slender anteriorly, but rather ventricose; piceous, lower surface and legs a little reddish, antennæ and palpi testaceous, former infuscate on 3 basal joints; rather shining, elytra not duller. *Head* elongate and slender, less than ¾ width prothorax; eyes moderately prominent, genæ oblique, not prominent; anterior supra-ocular seta missing; antennæ slender, 7th joint reaching about to base prothorax; mentum tooth broad, blunt or almost pointed. *Prothorax* rather small, 1/10 or less wider than long, suboval, slightly variable in outline, broadest at or behind middle; sides arcuate from base to apex *or* nearly straight and converging anteriorly and (less distinctly) posteriorly; basal angles broadly rounded, anterior angles better defined but scarcely prominent; margins rather narrowly explanate; posterior marginal seta a little before angle, anterior missing; disk convex, impressed as usual, basal foveæ moderately deep but not sharply defined, each with a vague depressed area extending forward nearly to apex; base and apex finely margined; surface slightly roughened basally but not distinctly punctate. *Elytra* much (about ¾) wider than prothorax, suboval, widest behind middle; sides straight and converging anteriorly; humeri broadly rounded; margins slightly sinuate before apices, which are independently pointed but not much produced; striæ deep, not punctate; intervals convex, 3rd 3-punctate as usual. Metepisterna with outer margins fully ½ longer than anterior; mesepisterna somewhat punctate, lower surface otherwise impunctate. Tibiæ not sulcate on outer edge; hind tarsi grooved each side above, less strongly internally, sulci not approximate, 4th joint emarginate, outer lobe much produced; front tarsi not distinctly grooved. Length 12.5-14; width 4.2-4.7 mm.

JAMAICA: holotype ♂ (M. C. Z. no. 21993) and 8 paratypes from Portland Gap, Blue Mt. Forest Reserve, main

range Blue Mts., about 5,000 ft., Aug. 17-19, 1934; in piles of dead vegetation and cracks in rotten logs.

Related to *C. macer* Darl. of Cinchona, Blue Mts., but differing notably in form.

Colpodes agonellus n. sp.

Small, broad, moderately depressed, very like an Agonum (*s. str.*) of the *melanarium* group; piceous to black, suture and margins of elytra sometimes reddish, appendages brownish; surface moderately shining, with microscopic silky alutaceous sculpture, elytra not duller. *Head* normal, between 3/5 and 2/3 width prothorax; eyes moderately prominent, genæ short and oblique; both supra-ocular setæ present; antennæ moderate, apex 7th joint reaching about to base prothorax; mentum tooth triangular, narrowly rounded at apex. *Prothorax* rather broad, about ½ wider than long; base almost truncate, ¼ (more or less) wider than apex; sides nearly evenly rounded except sometimes faintly sinuate before the obtuse but fairly distinct posterior angles; margins translucent, narrowly explanate anteriorly, broader posteriorly, each with usual 2 setæ; base and apex finely margined; disk moderately convex, depressed at sides basally but without distinct foveæ; middle line well impressed, transverse impressions vague; surface not distinctly punctate. *Elytra* broad, not quite ½ wider than prothorax; humeri somewhat rounded but distinct; margins moderately sinuate before apices, latter subindependently rounded or subtruncate, not produced; striæ moderately impressed, impunctate; 3rd interval 3-punctate, first puncture nearly on 3rd, second and third punctures on 2nd stria. Metepisterna with outer edges about ½ longer than anterior; inner wings dimorphic, full or reduced; body below impunctate. Tibiæ not sulcate on outer edge; posterior tarsi sulcate each side above, sulci not approximate, 4th joint rather small, simply emarginate; anterior tarsi lightly or not distinctly sulcate. Length 6.5-7.5; width 2.7-3.3 mm.

HAITI: holotype ♂ (M. C. Z. no. 21994) and 80 paratypes from La Visite and vicinity, 5,000 (on Mt. Bourette) —7,000 ft., La Selle Range, Sept. 16-23, 1934; under various cover on the ground in cloud forest and damp gullies.

For comparisons, see under the following species.

Colpodes pavens n. sp.

So similar to the preceding, *C. agonellus*, as to answer to the description of that species with the following changes: Color somewhat more brownish piceous. *Head* about 2/3 width prothorax. *Prothorax* relatively narrower, 1/3 wider than long; base 1/5 wider than apex; sides sinuate before the posterior angles, which are relatively prominent and approximately right, although more or less finely blunted; margins finer. *Elytra* relatively a little narrower, 2/5 wider than prothorax; striæ distinctly deeper; intervals more convex. Length 6.5 (slightly more or less); width about 2.6 mm.

HAITI: holotype ♂ (M. C. Z. no. 21995) and 3 paratypes, taken with the preceding species.

These species, *agonellus* and *pavens*, are among the most slightly specialized Colpodes, with the 4th joint of the posterior tarsus scarcely more emarginate, although somewhat shorter and broader, than in, for example, *Agonum melanarium* Dej. of the United States. They recall the Mexican Colpodes of the *nugax* group, but the latter resemble Anchomenus more closely than Agonum *s. str.*

Colpodes marcus n. sp.

Rather elongate and convex, appendages shorter than average; piceous, appendages scarcely paler; head and prothorax moderately shining, elytra somewhat duller. *Head* large, 4/5 or slightly less width prothorax, but appearing wider; eyes small, hardly at all prominent; genæ oblique, only slightly convex in profile, neck very little narrowed; 2 supra-ocular setæ each side; antennæ rather short, reaching about to base prothorax; mentum tooth triangular, pointed or somewhat blunted. *Prothorax* as long to about 1/8 *longer* than wide, subquadrate, slightly narrowed anteriorly and posteriorly, base about wide as apex; sides slightly, broadly arcuate, faintly sinuate at posterior marginal bristle; margins very narrow, each with usual 2 setæ, the posterior 1/10 or more before base; posterior angles rounded, but not very broadly so; base finely margined, apex not; disk convex except depressed near posterior

angles to form shallow, poorly defined foveæ, vaguely extended anteriorly; middle line distinct, transverse impressions weak; surface impunctate. *Elytra* rather narrow, about 1/3 wider than prothorax; humeri distinct; sides arcuate-parallel at middle, weakly sinuate before more or less independently rounded but not produced apices; striæ rather lightly impressed, impunctate; intervals barely convex, 3rd 3-punctate, punctures nearly on 3rd (1) and 2nd (2 & 3) striæ. Metepisterna with outer and anterior margins about equal; lower surface impunctate. Tibiæ not sulcate on outer edge; hind tarsi sulcate above externally, at most faintly so internally, 4th joint about rectangularly emarginate, not much lobed externally; front tarsi not distinctly sulcate; ♂ posterior trochanters more or less pointed, about ½ length femora. Length 10-13; width 3.7-4.0 mm.

HAITI: holotype ♂ (M. C. Z. no. 21996) and 47 paratypes from Mt. La Hotte, 5,000-7,800 ft., Oct. 16-17, 1934; 1 paratype from Roche Croix, on a spur of La Hotte, 5,000 ft., Oct. 13; under cover on the ground and in rotten logs in wet cloud forest.

I have named this species for my cook and number one boy on my La Hotte trip, Marc Jacques; the two following are named for my porters.

Colpodes wolla n. sp.

Rather elongate, convex, more lightly built than *marcus*; piceous, antennæ somewhat paler, legs scarcely so; head and prothorax moderately shining, elytra rather stongly alutaceous. *Head* 2/3 or slightly more width prothorax; eyes rather small but somewhat prominent; genæ suboblique, slightly convex but not very prominent; 2 supraocular setæ each side; antennæ average, 9th joint reaching about to base prothorax; mentum tooth pointed or slightly blunted. *Prothorax* subquadrate, as long or slightly longer than wide, slightly narrowed posteriorly and anteriorly; base slightly wider than apex; sides broadly and evenly rounded, sometimes faintly sinuate posteriorly; margins narrowly explanate, each with usual 2 setæ, the posterior about 1/10 before base; posterior angles obtuse, narrowly rounded; base finely margined, apex variably so; disk very

convex, almost gibbous except broadly depressed near posterior angles to form rather poorly defined but deep foveæ, which are continued forward parallel to margins as usual, not punctate; discal impressed lines as usual. *Elytra* a little (about 3/10) wider than prothorax, a little less parallel than in *marcus,* very convex; humeri distinct; subapical sinuation slight; apices more or less independently narrowly rounded; striæ excessively fine but entire; intervals flat, 3rd with 3 dorsal punctures as in preceding species. Metepisterna with outer and anterior edges about equal; lower surface impunctate. Tibiæ not sulcate on outer edge; posterior tarsi above lightly grooved externally, not or faintly internally, 4th joint moderately deeply emarginate, outer lobe a little longer than inner; front tarsi not distinctly sulcate; ♂ posterior trochanters somewhat pointed, about ½ length femora. Length 11-14; width 3.8-4.4 mm.

HAITI, MASSIF DE LA HOTTE: holotype ♂ (M. C. Z. no. 21997) and 3 paratypes from ridge just above Roche Croix, on a spur of Mt. La Hotte, 5,000 ft., Oct. 13; 1 ♂ from N. slope La Hotte, 5,000 ft., Oct. 14; 1 ♀ from Desbarrière, about 4,000 ft., Oct. 13; 2 ♂ ♀ from first rain forest on auto road N. of Camp Perrin, about 3,000 ft., Oct. 21; all taken in loose leaf mold and under loose bark of dead trees in wet forest.

Colpodes amone n. sp.

So similar to the preceding, *wolla,* as to answer to the description of that species except as follows: Smaller and more graceful; slightly less convex. *Head* relatively a trifle wider; antennæ with 7th joint reaching about to base prothorax. *Prothorax* with fine anterior margin more distinct. *Elytra* scarcely or not sinuate on outer margin before apex (sometimes scarcely so in *wolla*); striæ slightly more distinct but still fine. Posterior trochanters of ♂ short, rounded-truncate as in ♀. Length 10-11.5; width 3.7-3.9 mm.

HAITI: holotype ♂ (M. C. Z. no. 21998) and 7 paratypes from on and near summit La Hotte, about 7,000-7,800 ft., Oct. 16-17, 1934; in moss and loose leaf mold in forest.

Colpodes christophe n. sp.

Very large, rather broad and depressed; black, moderately shining, elytra very slightly duller; appendages piceous. *Head* barely more than 3/5 width prothorax; eyes small but somewhat prominent; genæ oblique, slightly convex, not prominent; 2 supra-ocular setæ each side; antennæ rather short, 9th or 10th joint reaching base prothorax; mentum tooth finely pointed. *Prothorax* large, subquadrate, 1/5 or 1/6 wider than long; base squarely truncate, not quite ¼ wider than apex; sides slightly arcuate anteriorly, broadly, slightly sinuate before posterior angles, which are almost right, with apices very narrowly rounded; side margins broadly but not strongly explanate, each with 2 setæ; base finely margined, apex not; disk rather flat, impunctate, depressed posterio-laterally to form moderately deep, not very well defined foveæ which extend anteriorly to or before middle; other impressed lines as usual. *Elytra* not much (♂ not quite 1/5, ♀ not quite 3/10) wider than prothorax, moderately convex; sides arcuate-subparallel at middle, slightly sinuate before apices, which are narrowly, subindependently rounded; humeri distinct; striæ somewhat impressed, entire, not punctate except for usual 3 dorsal punctures attached to 3rd interval; intervals somewhat convex. Metepisterna with outer edge somewhat longer than anterior; lower surface not punctate. Tibiæ not sulcate on outer edge; posterior tarsi finely grooved above externally, less strongly so internally, 4th joint moderately deeply emarginate, not distinctly lobed; anterior tarsi finely grooved at sides in ♀, not in ♂; ♂ posterior trochanters about 3/5 length femora, suddenly narrowed just before middle of femoral length, thence very slender to apex; ♀ trochanters slightly less than ½ length femora, but with apices subtuberculate at point corresponding to ♂ apical process. Length 17-18; width 6-6.2 mm.

HAITI: holotype ♂ (M. C. Z. no. 22001) and 1 ♀ paratype from summit plateau of Mt. Basil, northern Haiti, 4,700 ft., Sept. 9, 1934; under stones in a tiny garden recently cleared from cloud forest.

This is one of the largest and finest species of the whole great genus Colpodes.

Colpodes cychrinus n. sp.

Rather large, broad, subdepressed; black, moderately shining, elytra scarcely duller, appendages red-piceous. *Head* relatively narrow, between ½ and 3/5 width prothorax, structure as in *christophe*. *Prothorax* wide, about 45/100 wider than long; base truncate, about 1/3 wider than apex; sides rather strongly arcuate throughout, with margins even broader and more strongly explanate than in *christophe;* posterior angles obtuse, but only very narrowly rounded; base and apex finely margined; disk about as in *christophe*. *Elytra* not much (¼, more or less) wider than prothorax, rather short, not or faintly sinuate near apex; striæ a little shallower, intervals flat or nearly so; otherwise as in *christophe*. Characters of lower surface and legs (♀) as in *christophe* except hind trochanters (♀) only about 1/3 length femora, broad and not tuberculate at apex.

HAITI: holotype ♀ (M. C. Z. no. 22002) and 2 ♀ paratypes, all with the same data as the types of *christophe*.

Closely related to *christophe,* but the prothorax is strikingly different in shape, and the hind trochanters are not modified in the ♀ and probably not in the ♂, for in the three species I know with modified ♂ trochanters (*christophe, marcus,* and *wolla*) there is a corresponding but slighter modification in the ♀.

Colpodes jægeri (Dej.)

Dejean 1831, Spec. Coleop. 5, 728 (Anchomenus)
Chaudoir 1859, Ann. Soc. Ent. France (3) 7,315
Chaudoir 1878, *l. c.* (5) 8,280 & 300
Darlington 1934, Psyche 41, 92 (in key)

HAITI: summit of Morne Tranchant, Massif de la Selle (but not main range), about 6,000 ft., Nov. 11, 1934; 4 specimens, both sexes. These agree very well with Dejean's and Chaudoir's (1859) long descriptions.

Colpodes subcordens n. sp.

Moderately broad, average convexity; black, moderately shining, elytra not duller (whole surface sometimes obscured by a thin, tenaceous coating of foreign matter);

appendages red-piceous. *Head* about 2/3 width prothorax, formed as in *jægeri,* with genæ very convex in profile, scarcely less prominent than eyes; 2 supra-ocular setæ each side; antennæ average, apex 8th joint reaching to about base prothorax; mentum tooth variable, with apex bluntly rounded, subtruncate, or emarginate, channeled along middle. *Prothorax* subcordate, 1/3 or slightly less wider than long, base only slightly (1/10-1/7) wider than apex; sides strongly, often rather irregularly rounded anteriorly, very slightly to moderately sinuate before the slightly obtuse, very narrowly rounded of blunted posterior angles; margins rather widely explanate, each with usual 2 setæ; base finely margined, apex not distinctly so; disk with usual impressions, as in *jægeri,* impunctate. *Elytra* as in *jægeri* except a little more narrowed basally, with sides less parallel; humeri distinct; striæ deep, impunctate; intervals convex, 3rd 2-punctate, about ¼ from base and at middle, 3rd (posterior) puncture uniformly missing. Metepisterna with outer edges only slightly longer than anterior; lower surface impunctate. Tibiæ not sulcate externally; posterior tarsi sulcate each side above, but inner sulcus sometimes indistinct, sulci not approximate, 4th joint moderately deeply emarginate but only slightly lobed externally; anterior tarsi not distinctly grooved at sides in either sex. Length 12-15; width 4.6-5.5 mm.

HAITI: holotype ♂ (M. C. Z. no. 22003) and 17 paratypes from La Visite and vicinity, main La Selle range, 5,000-7,000 ft., Sept. 16-23, 1934; under stones and in damp moss and loose leaf mold in cloud forest.

Colpodes tipoto n. sp.

Form about average, less broad than in *jægeri* and *subcordens* and more subparallel; piceous black, lower surface and appendages rufescent; moderately shining, elytra not duller. *Head* formed as described for *subcordens* but relatively broader, about ¾ width prothorax; antennæ slightly shorter; mentum tooth blunted triangular. *Prothorax* subquadrate, ¼ wider than long; base truncate, about 1/10 wider than apex; sides less rounded than in preceding species, straight or faintly sinuate before obtuse but distinct basal angles; margins narrowly explanate, each with

2 setæ; base finely margined, apex not; disk about as in *jægeri* and *subcordens*. *Elytra* slightly (barely over ¼) wider than prothorax; sides subparallel, faintly narrowed in basal ½; humeri distinct; sides slightly sinuate before apices; latter narrowly subindependently rounded; striæ moderately deep but less so than in 2 preceding species, impunctate; intervals moderately convex, 3rd with anterior and middle punctures present, posterior missing. Metepisterna and lower surface as in *subcordens*, as are also tibial and tarsal characters. Length 10.5-11; width between 3.5 & 4.0 mm.

HAITI: holotype ♂ (M. C. Z. no. 22004) and 1 ♀ paratype from vicinity La Visite, main range La Selle, about 6,500 ft., Sept. 16-23, 1934; under deeply buried logs in cloud forest.

Named for the headman of the porters whom Dr. Marston Bates, Mr. André Audant, and I had with us on our La Selle trip.

Colpodes constricticeps n. sp.

Rather slender, subdepressed; piceous, lower surface and appendages a little more rufescent; moderately shining, elytra not duller. *Head* large, about 4/5 width prothorax; eyes small but slightly prominent; genæ convex, prominent, head behind them rather strongly constricted (for Colpodes) at sides and across occiput; 2 supra-ocular setæ each side; antennæ moderate, 8th joint about opposite base prothorax; mentum tooth rather broad, apex slightly, rather broadly emarginate (probably variable). *Prothorax* elongate-cordate, just over 1/10 wider than long; base squarely truncate, as wide as apex; sides arcuate anteriorly, broadly sinuate before right posterior angles; margins narrowly explanate, each with usual 2 setæ; base and apex finely margined; disk as in *jægeri* or *subcordens* except transverse impressions rather better defined and surface at extreme base (behind posterior transverse impression) irregularly transversely subrugose. *Elytra* elongate, about 2/7 wider than prothorax, somewhat depressed (much more than in *jægeri* and allies), widest about 1/3 from apex; sides almost straight and converging in more than anterior ½; humeri distinct but narrow and rather rounded,

humeral marginal line strongly angulate (arcuate in *jægeri* and allies); subapical sinuation slight; apices independently narrowly rounded; striæ moderately impressed, impunctate; intervals a little convex, 3rd with 2 punctures, near middle and ¼ from *apex*, *basal* puncture missing. Lower surface and characters of tibiæ and tarsi as described for *subcordens*, except 4th joint hind tarsi not at all more lobed externally than internally. Length 11; width 3.6 mm.

HAITI: holotype ♂ (M. C. Z. no. 22005), unique, from summit Mt. La Hotte, about 7,800 ft., Oct. 16, 1934; under a deeply buried stone in damp, mixed forest.

A very distinct species, though related to the *jægeri* group. The absence of the anterior dorsal puncture of elytra is probably not a character of much significance, for the puncture is absent in one specimen of my series of *subcordens* and is known to be either present or absent in at least one other Colpodes, *haptoderoides* Bates of Mexico (Trans. Ent. Soc. London 1891, p. 252).

Colpodes punctus n. sp.

Moderately elongate and depressed; dark brown, appendages a little paler; rather shining, elytra not duller. *Head* 4/5 width prothorax; eyes moderately prominent; genæ oblique, not prominent; 2 supra-ocular setæ each side; antennæ moderately elongate, 7th joint about opposite base prothorax; mentum tooth slender, pointed. *Prothorax* rather small, rounded-subquadrate, barely wider than long; base very slightly lobed at middle, rounded-oblique at sides, slightly wider than apex; sides evenly, not strongly rounded, margins very narrowly explanate, anterior lateral seta missing; basal angles rounded-obtuse; base and apex finely margined; disk with middle line fine but distinct, transverse impressions vague; basal foveæ moderate, rounded, with usual vague anterior extension, punctate-rugose, base of pronotum behind transverse impression also rugulose. *Elytra* much (about 3/4) wider than prothorax, moderately elongate; humeri distinct; sides nearly parallel at middle, slightly sinuate before apices, which are irregularly, almost conjointly rounded; disk rather depressed; striæ moderate, inner ones faintly, outer ones much more distinctly punctulate; intervals flat or slightly convex, 3rd 3-punctate.

Metepisterna very elongate; they, sides of metasterna, mesepisterna, first ventral, and a small part of sides of prosternum closely, not very coarsely punctate. Tibiæ not sulcate on outer edge; hind tarsi not distinctly grooved above, 4th joint deeply emarginate, strongly lobed externally; front tarsi exceptionally broad in both sexes, not distinctly sulcate above. Length 11.5-13; width 4.2-4.6 mm.

JAMAICA: holotype ♂ (M. C. Z. no. 22006) and 6 paratypes from Cinchona (Blue Mts.), 5,000 ft., Jan. 1912, C. T. Brues collector.

Colpodes bruesi n. sp.

Elongate; purplish blue-black, metallic color stronger on elytra, lower surface and legs rufopiceous, antennæ dark; surface rather shining, elytra not duller. *Head* about ¾ width prothorax, elongate; eyes prominent; genæ oblique, not prominent; 2 supra-ocular setæ each side; antennæ slender, 6th or 7th joint about opposite base prothorax; mentum tooth acutely pointed. *Prothorax* barely wider than long, subquadrate oval; base about 1/3 wider than apex, formed as in *punctus;* sides evenly, not strongly rounded, margins moderate, much wider than in *punctus,* anterior seta missing; basal angles obtuse, almost rounded; base and apex finely margined; disk almost as in *punctus* except basal foveæ more distinctly extended forward; foveæ and base rather lightly punctate. *Elytra* much (¾) wider than prothorax, disk rather depressed; humeri distinct; sides slightly convergent in anterior ½, slightly sinuate before the apices, which are independently subangulate; striæ rather fine, impunctate; intervals faintly convex, 3rd 3-punctate. Metepisterna very elongate; sides of body below rather indistinctly punctate. Tibial and tarsal characters as in *punctus.* Length 15.5; width 5.5 mm.

JAMAICA: holotype ♂ (M. C. Z. no. 22007), unique, from Newton, 3,000 ft., Jan., 1912, C. T. Brues collector.

Colpodes visitor n. sp.

Broadly subfusiform; rather shining black or piceous, elytra sometimes faintly æneous, lower surface and legs rufopiceous, mouth parts and antennæ rufous. *Head* small,

a trifle less than 2/3 width prothorax; eyes prominent; genæ short, oblique or slightly convex in profile; 2 supra-ocular setæ each side; antennæ average, 8th joint reaching opposite or beyond base prothorax; mentum tooth a little bluntly pointed. *Prothorax* about 1/3 wider than long, not narrowed behind, strongly so in front; base squarely truncate, more than ½ wider than apex; sides parallel in basal ½, arcuate-converging anteriorly; margins narrowly explanate, each with 2 setæ; basal angles right, scarcely blunted; base and apex finely margined; disk with middle line fine but distinct, transverse impressions vague; basal foveæ rather deep, irregular, impunctate, vaguely prolonged anteriorly as usual. *Elytra* moderately (45/100) wider than prothorax, rather short; humeri distinct; sides parallel at middle, sinuate before the independently rounded apices; striæ moderately deep, inner ones impunctate, outer irregular, faintly punctulate or interrupted; intervals somewhat convex, 3rd 3-punctate as usual. Metepisterna with outer edges fully ½ longer than anterior; body below not punctate. Tibiæ not grooved on outer edge; hind tarsi sulcate each side above, sulci not approximate, 4th joint moderately emarginate, scarcely lobed externally; front tarsi not distinctly grooved above. Length 9-10.5; width 3.7-4.1 mm.

HAITI: holotype ♂ (M. C. Z. no. 22008) and 13 paratypes from La Visite and vicinity, La Selle Range, about 6,000 ft., Sept. 16-23, 1934; in cracks in rotten logs and under loose bark and similar cover in cloud forest.

Colpodes baragua n. sp.

Colpodes sp. Darl. 1934, Psyche 41, pp. 93 (in key) & 97

Form Anchomenus-like; black, shining, appendages brownish piceous. *Head* about ¾ width prothorax; eyes prominent; genæ short and oblique; 2 supra-ocular setæ each side; antennæ rather slender, 7th joint reaching beyond base prothorax; mentum tooth with apex narrowly rounded. *Prothorax* cordate, ¼ wider than long, rather strongly narrowed in front and behind; base squarely truncate at middle, slightly oblique at sides, about 15/100 wider than apex; sides strongly arcuate anteriorly, strongly sinuate before the right posterior angles; margins rather

narrowly explanate, each with 2 setæ; base and apex finely margined; disk impressed as usual, basal foveæ relatively small and deep, impunctate. *Elytra* much (about 2/3) wider than prothorax; humeri distinct; sides subparallel, though *slightly* converging anteriorly in anterior ½, sinuate before the subindependently narrowly rounded apices; striæ moderately deep, impunctate on disk, lightly punctate externally; intervals more or less convex, 3rd 3-punctate. Metepisterna elongate; mesepisterna somewhat punctate, lower surface otherwise impunctate. Tibiæ not grooved on outer edge; posterior tarsi sulcate each side above, sulci not approximate, 4th joint moderately emarginate, not more lobed externally than internally; front tarsi vaguely sulcate. Length 10.5; width about 4 mm.

CUBA: holotype ♀ (M. C. Z. no. 22009), unique, from Baraguá (Camagüey), May 7, 1928, at light, L. C. Scaramuzza collector; from the collection of the Tropical Plant Research Foundation, now at the Harvard research station at Soledad. The specimen previously recorded by me was from Somorrostro (Havana), Barro collector.

This species is strongly winged and found at low altitudes, and I at first thought it might occur also in Central America and have been previously described, but I cannot identify it with any Central American species.

Colpodes æquinoctialis (Chd.)

Stenocnemis jägeri Mann.

Colpodes mannerheimi Chd.

A series which I took in Haiti and Jamaica is not distinguishable from our specimens from Mexico, Panama, and Peru.

Colpodes altifluminis n. sp.

Moderately elongate; shining piceous, lower surface and legs very slightly, antennæ and palpi more distinctly rufescent. *Head* ¾ width prothorax, formed as in *æquinoctialis*, with prominent eyes and oblique, not prominent genæ; 2 supra-ocular setæ each side; antennæ moderately slender, 7th joint reaching about to base prothorax; mentum tooth subtruncate or slightly emarginate at apex. *Prothorax* subcordate, ¼ (more or less) wider than long,

formed somewhat as in *æquinoctialis* but with anterior angles much less prominent; base truncate at middle, rounded-oblique at sides, 1/10 or slightly more wider than apex; sides moderately, somewhat irregularly arcuate anteriorly, briefly sinuate before posterior angles, which are right or slightly obtuse, very narrowly blunted; explanate margins rather narrow, each with 2 setæ; base finely margined, apex rather indistinctly so; disk convex, with usual fine middle line and poorly defined transverse impressions; basal foveæ rather deep, round, only vaguely prolonged anteriorly, impunctate. *Elytra* considerably (not quite 2/3) wider than prothorax, of moderate length, shorter and with base more narrowed than in *æquinoctialis*, and with humeri more broadly rounded, though not entirely obliterated; sides moderately sinuate before apices, which are rather narrowly independently rounded, sometimes vaguely subangulate; striæ fine, shallow, finely irregular and interrupted; intervals flat or slightly convex, 3rd 3-punctate. Metepisterna with outer edges a little more than ½ longer than anterior edges, distinctly shorter than in *æquinoctialis*, although both species are winged; lower surface impunctate. Tibiæ not sulcate on outer edge; hind tarsi sulcate each side above, sulci not closely approximate although tarsi are slender, 4th joint rather deeply emarginate, outer lobe much longer than inner; front tarsi more or less indistinctly sulcate above (these characters as in *æquinoctialis*, but all sulci less impressed in *altifluminis*). Length 11-11.5; width 3.8-4.0 mm.

HAITI: holotype ♂ (M. C. Z. no. 22010) and 8 paratypes from vicinity of La Visite, main La Selle Range, about 6,000 ft., Sept. 16-23, 1934; taken among loose stones and in piles of drift beside the stream called by the local Negroes the "Rivière Blanche."

Colpodes latelytra n. sp.

Form about as in *C. chalybeus* Dej., but elytra relatively wider; dark bluish black with faint greenish iridescence in some lights, moderately shining; appendages black. *Head* rather small but with prominent eyes (not quite so prominent as in *chalybeus*), 5/6 width prothorax; genæ short and oblique; 2 supra-ocular setæ each side; antennæ aver-

age, 8th joint about opposite base prothorax; mentum tooth narrowly blunted at apex. *Prothorax* small, subcordate but not strongly narrowed basally, about 1/8 wider than long; base truncate at middle, rounded-oblique at sides, about 1/5 wider than apex; sides arcuate in anterior ¾, moderately sinuate before the right, narrowly blunted basal angles; margins rather narrowly explanate anteriorly, somewhat broader posteriorly, each with posterior seta present, anterior missing (as in *chalybeus*); disk somewhat convex, middle line and anterior transverse impression fine but distinct, posterior transverse impression vague; basal foveæ deep but not sharply defined, very distinctly prolonged to middle, less distinctly nearly to apex; surface within and near foveæ and across base transversely wrinkled-rugulose. *Elytra* subquadrate, virtually twice as wide as prothorax (in *chalybeus* about 1 7/10 times width prothorax); humeri rounded but not narrowed; sides faintly sinuate before independently narrowly rounded apices; disk convex; striæ slightly impressed, faintly punctulate, except 2 external striæ each side, and all striæ at apex, much deeper and impunctate; intervals broad and slightly convex except 8th and 9th, and all at apex, narrow and very convex; 3rd finely 3-punctate. Metepisterna very elongate; inner wings full; body not punctate below. Tibiæ finely grooved along middle of outer edge; posterior tarsi strongly grooved each side and at middle above, grooves approximate so joints seem bicarinate, 4th joint emarginate, outer lobe somewhat longer than inner; front tarsi also grooved both laterally and at middle (these tibial and tarsal characters about as in *chalybeus*). Length 7.6; width about 3.2 mm.

JAMAICA: holotype ♂ (M. C. Z. no. 22011), unique, from main range Blue Mts., about 5,000 ft., Aug. 17, 1934; shaken from a pile of dead, cut grass in a narrow road through forest at Portland Gap, Blue Mt. Forest Reserve.

Allied to *C. chalybeus* Dej. (Lesser Antilles to Brazil), of which we have specimens, but with broader elytra, with 8th and 9th intervals differently modified.

Agonum (s. s.) laetificum n. sp.

Moderately broad, rather depressed; head and prothorax

moderately shining black, faintly greenish, elytra shining greenish coppery with margins not different; lower surface and appendages piceous. *Head* just under 2/3 width prothorax; eyes only moderately prominent; genæ short and oblique; antennæ average, apex of 8th joint reaching about to base prothorax; mentum tooth acute. *Prothorax* rather large, rounded, just over 1/3 wider than long; sides arcuate from base to apex, margins rather narrowly explanate; posterior angles broadly rounded; base and apex finely margined; disk only slightly convex, middle line fine, transverse impressions vague, basal foveæ rather shallow, not sharply defined, only vaguely continued anteriorly, not punctate. *Elytra* moderately (about 2/5) wider than prothorax; humeri somewhat rounded but not narrowed; sides arcuate-subparallel at middle, sinuate before the apices, which are subindependently rounded; striæ moderate, not less impressed at apex, impunctate; intervals flat or slightly convex, polished, 3rd 3-punctate, first puncture attached to 3rd, 2nd and 3rd punctures to 2nd striæ. Metepisterna with outer edges a little more than ½ longer than anterior; inner wings full. Tibiæ not sulcate on outer edge; hind tarsi with 3 basal joints sulcate each side, 4th not sulcate, shallowly emarginate; front tarsi not sulcate, at least in ♂. Length 7.7; width 3.0 mm.

HAITI: holotype ♂ (M. C. Z. no. 22023), unique, from summit plateau Mt. Basil, 4,700 ft., Sept. 9; among loose dead leaves on the ground in a small patch of wet cloud forest.

Very similar to *Agonum cupripenne* Say, especially to the form with the disk of elytra not strongly coppery, and probably an actual relative of that species, but broader and more depressed, with pronotum scarcely metallic, and without the conspicuous, bright green, strongly alutaceous margin of elytra of *cupripenne*.

Chlaenius jamaicae n. sp.

Form average; head and prothorax rather shining dark bluish or green, elytra dark dull bluish; lower surface including epipleuræ dark; appendages testaceous, antennæ a little brownish. *Head* ¾ width prothorax; eyes prominent; front very finely punctulate; clypeus and labrum slightly

emarginate; antennæ with 3rd joint equal to 4th, 7th about opposite base prothorax. *Prothorax* subcordate, 1/5 or ¼ wider than long, moderately narrowed in front and behind; base truncate, ¼ wider than apex; sides arcuate through most of length, briefly and not strongly sinuate basally, narrowly margined, lacking anterior seta as usual; basal angles slightly obtuse, narrowly blunted; disk convex, impressed and foveate as usual, rather closely punctate and slightly alutaceous across base, sparsely punctate and shining anteriorly, with narrow impunctate area each side near middle. *Elytra* about 2/5 wider than prothorax, convex, very slightly narrowed basally; humeri rounded but not obliterated, marginal line arcuate; striæ rather fine, faintly punctulate; intervals nearly flat, very finely granulate-opaque, pubescence shorter and less obvious than usual. Prosternum margined at apex; metepisterna about ½ longer than wide; sides of body below and entire abdomen rather finely punctate-pubescent. Femora and tarsi not densely pubescent above; ♂ with front femora not modified, middle tibiæ not pubescent at apex. Length 11-12.5; width 4.1-4.8 mm.

JAMAICA: holotype ♂ (M. C. Z. no. 22024) and 8 paratypes from Ocho Rios, Aug. 20-24; 1 paratype each from Rio Cobre, 5 mi. above Spanishtown, Aug. 29 and between Kingston and Spanishtown, Aug. 29; all taken under cover beside ponds, swamps, or rivers.

Very close indeed to *Chlænius viridicollis* Reiche and *C. obscuripennis* Chev., both of Mexico and both represented by small series in our collection (the two may be identical), but differing in the conspicuously shorter pubescence of elytra.

Stenocrepis (s. s.) palustris n. sp.

Subparallel, moderately broad and convex; black, moderately shining, only slightly æneous with margins of elytra scarcely more so; lower surface and legs piceous; tarsi, palpi, and bases of antennæ more or less rufescent. *Head* a little over ½ width prothorax, but appearing narrower; formed as in *12-striatus* (Chev.) and similarly finely, closely subpunctulate; mentum tooth short, wide, blunt. *Prothorax* a trifle over 2/5 wider than long, moderately strong-

ly narrowed in front, a trifle behind; base ¾ or more wider than apex; sides nearly evenly arcuate throughout; basal angles about right or a trifle obtuse; disk moderately convex, not punctate; middle line very fine, other impressions extremely vague or absent. *Elytra* only slightly (about 1/6) wider than prothorax, very convex; humeri distinct, denticulate; sides straight, parallel or faintly *diverging posteriorly* for most of length, subapical sinuation and apices as in *12-striatus*; each elytron with 6 moderately deep, smooth, straight striæ as in *12-striatus*, 7th stria extremely faint; scutellar stria almost obsolete; intervals slightly convex, 3rd without dorsal punctures. Metepisterna and sides of metasternum very coarsely, first ventral coarsely, 2nd ventral and mesepisterna anteriorly much less distinctly punctate. Front tarsi ♂ about as in *12-striatus*, with 2nd joint about as long as wide. Length 7.5-8.5; width 3.1-3.6 mm.

HAITI: holotype ♂ (M. C. Z. no. 22025) and 19 paratypes from swamps north of Dessalines, Sept. 11; 3 paratypes from Trou Caïman, Nov. 15-20; taken under cover in and beside swamps.

Resembles *S. duodecimstriatus* (Chev.), to which it runs in Chaudoir's monograph (Ann. Soc. Ent. France (6) 2, 1882, pp. 485-), but relatively a little broader especially posteriorly, with shorter prothorax and more convex elytra, and with weaker æneous luster, characters which enabled me to distinguish the new species from *12-striatus* even in the field. The two occurred together at Trou Caïman. The 3rd interval of each elytron is 2-punctate in *12-striatus*, impunctate in *palustris*.

Selenophorus flavilabris cubanus n. subsp.

S. flavilabris Darl. 1934, Psyche 41, 105 (not Dej.)

Very similar to true *flavilabris* Dej., of which I now have 171 specimens from Haiti and Jamaica (type locality: "Antilles"). Similar in variable, usually greenish or bluish, metallic color, highly polished surface, and impunctate base and foveæ of prothorax. Differs conspicuously in having the legs entirely testaceous; the femora are dark in true *flavilabris*. The Cuban subspecies averages a little smaller, but not sufficiently to be significant if it were

not for the difference in color of legs. Length 6.5-8.0; width 2.6-3.3 mm.

CUBA: holotype ♂ (M. C. Z. no. 22026) and 35 paratypes from Soledad, near Cienfuegos, various dates and collectors.

Bradycellus (Stenocellus) selleanus n. sp.

Form about average for genus; black, very polished, margins of elytra (especially apically) translucent testaceous; suture not pale; palpi, legs, base of mandibles, and base of antennæ testaceous, apex of mandibles and antennæ except basally darker. *Head* as usual in Stenocellus, about ¾ width prothorax, impressions deep; antennæ rather stout, 9th joint reaching about to base prothorax; mentum tooth acute. *Prothorax* subcordate, about ¼ wider than long; base about width apex; sides arcuate anteriorly, briefly but usually rather strongly sinuate before posterior angles; latter briefly right or slightly obtuse, more or less strongly dentiform; disk as usual; basal foveæ shallow, rather coarsely punctate. *Elytra* normal for genus, about 2/5 wider than prothorax, not very elongate; no scutellar stria; other striæ entire, impunctate; intervals slightly convex, polished, 3rd with single puncture on inner edge behind middle. Male front tarsi moderately dilated, biseriately squammulose; middle tarsi slender, inconspicuously squammulose. Length 3.5-4.2; width 1.4-1.6 mm.

HAITI: holotype ♂ (M. C. Z. no. 22027) and 31 paratypes from La Visite and vicinity, La Selle Range, 5,000-7,000 ft., Sept. 16-23; 3 paratypes from Kenskoff, a few miles north of type locality, about 5,000 ft., Nov. 8; common under ground cover in cloud forest and damp ravines.

Comparable only with *Bradycellus circumdatus* Bates of Mexico (we have a small series from *Biologia* material), but smaller, much more polished, with sides of prothorax more briefly but much more strongly sinuate before base.

Pogonodaptus rostratus n. sp.

Form of *P. mexicanus* (Bates) (*piceus* Horn); polished piceous, more or less rufescent, margins of elytra (especially apically) testaceous; legs testaceous with dark knees; antennæ brownish, testaceous at base. *Head* of ♂ very

large, barely narrower than prothorax but appearing at least as wide; genæ subprominent, subtuberculate; mandibles long, not strongly arcuate; clypeus emarginate, subtuberculate each side; labrum deeply emarginate; frontal sulci very deep, much closer together (where most approximate) than to eyes; head in ♀ about 6/7 width prothorax, with mandibles a little less prominent, genæ short and not prominent, frontal sulci much less aproximate. *Prothorax* broadly cordate, ½ or slightly more wider than long, much narrowed basally; base 1/10 to 1/5 narrower than apex; sides broadly rounded except very briefly sinuate before posterior angles; latter would be rounded except for small, obtuse prominence; disk about as in *mexicanus* except more depressed and roughened across base, with narrower posterior margin, and with anterior transverse impression more distinct, lying behind the (interrupted) anterior marginal line. *Elytra* about as in *mexicanus*. Measurements: large ♂ 8 by 2.5; small ♀ 7.2 by 2.3 mm.

HAITI: holotype ♂ (M. C. Z. no. 22028) and 40 paratypes from swamps north of Dessalines, Sept. 11; in loose soil and piles of trash near the water.

As compared with *mexicanus*, of which we have a fine series from Texas (Brownsville), Mexico (Vera Cruz), and Colombia (near Santa Marta), the ♂ of *rostratus* has more prominent mandibles and genæ and much more approximate frontal sulci (nowhere closer to each other than to the eyes in *mexicanus*). The thorax of the new species differs also, as noted in the description.

Lebia haitiana n. sp.

Typical Lebia form; weakly shining; black, side margins of prothorax pale translucent testaceous; elytra testaceous with basal blotch (between 4th striæ), broad, slightly irregular post-median fascia (extending laterally to the marginal striæ), a broad sutural connecting stripe (constricted nearly to first striæ at basal 1/3) between the basal and post-median marks, a very narrow apical sutural line, and a small spot near the outer apical angle of each elytron black or dark brown; lower surface black; legs testaceous; palpi brown with pale tips. *Head* about 4/5 width prothorax; eyes very prominent; front longitudinally

rugulose; mentum tooth short, broadly rounded; palpi not thickened. *Prothorax* transversely quadrate, about 2/3 wider than long, with anterior angles rounded, posterior bluntly right, preceded by a slight sinuation of the sides; explanate margins rather broad; disk moderately convex, irregularly (transversely at middle, sublongitudinally at sides) rugulose. *Elytra* wide, about 5/6 wider than prothorax, moderately convex; striæ rather deep, impunctate, except 3rd with usual 2 dorsal punctures on each elytron; intervals somewhat convex, alutaceous. Posterior tarsi with 4th joint bilobed; claws each with 4 rather long teeth below. Length 5.3-5.7; width 2.6-2.8 mm.

HAITI: holotype ♂ (M. C. Z. no. 22029) from vicinity of Port-au-Prince, Oct. 6; 1 ♂ paratype from Poste Terre Rouge, 2,000 ft., Oct. 5; 1 ♂ paratype from Port-au-Prince, Jan. 1925, G. N. Wolcott, from André Audant. My two specimens were taken by sweeping vines along overgrown roadsides.

The pattern of the elytra resembles, at first glance, that of *Lebia fuscata* Dej., but closer examination shows that *haitiana* lacks the dark marginal streak which, in *fuscata*, extends forward from the post-median fascia on each side, while *fuscata* has no separate posterior-lateral spot. The two species are very differently sculptured. In Chaudoir's key, *haitiana* runs to the *analis* group (Bull. Soc. Nat. Moscow 44, 1871, part 1, p. 23), but neither *analis* nor any of the other species listed has the thorax uniform black (except for the margins) as in *haitiana*, nor does the pattern of the elytra of the latter coincide exactly with any of them.

Lebia nigrita n. sp.

Lebia-like, but with very convex elytra; black, weakly shining, appendages and explanate margins of prothorax brownish. *Head* 6/7 width prothorax; eyes prominent; front alutaceous, not rugulose, with punctiform median impression; mentum tooth short, broadly rounded; palpi rather short but not much incrassate. *Prothorax* about 3/5 wider than long, transversely quadrate; anterior angles rounded, posterior right, with sides before them straight; explanate margins moderate; disk moderately convex,

alutaceous, faintly transversely strigulose. *Elytra* more than 4/5 wider than prothorax, very convex but nearly normal in outline from above; striæ deep, impunctate, except 3rd on each elytron with 2 unusually coarse dorsal punctures; intervals moderately convex, alutaceous. Hind tarsus with 4th joint bilobed; each claw with 3 rather long teeth on inner edge. Length 3.6; width 1.9 mm.

HAITI: holotype ♂ (M. C. Z. no. 22030), unique, from hills south of Port-au-Prince (edge of Massif de la Selle), about 2,000 ft., Oct. 2; taken by sweeping path-side vines and weeds.

In Chaudoir's key this runs to *scitula* Chd. and allies (*l. c.*, p. 24), but is very much smaller than any of the species listed. It is probably actually more closely related to some of the very convex continental species such as *hilaris* Chd. and *granaria* Putz., but the uniform coloration and deep striæ distinguish it.

Lebia gibba n. sp.

Of the same small, convex form as the preceding; rather shining blue, lower surface and appendages black. *Head* about 5/6 width prothorax; eyes a little less prominent than in *nigrita;* front lightly alutaceous, not strigulose, with median puncture; mentum tooth short and broadly rounded; palpi rather short but not much incrassate. *Prothorax* transversely subquadrate, 2/3 wider than long; anterior angles rounded; posterior angles almost right, sides before them straight but converging posteriorly; sides of base slightly oblique toward rear, so that angles are directed slightly backward; explanate margins moderate; disk very convex, shining, neither punctate nor alutaceous. *Elytra* about ¾ wider than prothorax, very convex, but with nearly normal marginal outline; striæ rather shallow, impunctate except for 2 rather small dorsal punctures on 3rd on each elytron; intervals slightly convex, rather shining, only very faintly alutaceous. Hind tarsi with 4th joint bilobed; each claw with 3 teeth. Length about 3.3; width 1.7 mm.

HAITI: holotype ♂ (M. C. Z. no. 22031), unique, from Hinche, Aug. 30, 1930, H. L. Dozier collector, from Mr. André Audant.

Much like the preceding (*nigrita*) in form, but differently colored, more shining, with somewhat shallower elytral striæ, and with somewhat differently formed prothorax, with much more convex disk.

Phlœoxena montana n. sp.

Form as in normal Phlœoxena except elytra more oval and much more convex; head and prothorax moderately shining, elytra duller; brownish piceous above and below, epipleuræ of elytra and last ventral segment pale; femora testaceous, tibiæ a little browner; palpi and antennæ slightly brownish testaceous. *Head* about 85/100 width prothorax, normal for Phlœoxena except eyes a trifle less prominent than usual; front alutaceous, with 2 anterior and single median impressions weak; antennæ rather stout, 8th joint reaching about to base prothorax; mentum tooth rounded at apex. *Prothorax* 1/6 or 1/7 wider than long, narrowed behind; base truncate, a little narrower than apex; sides weakly arcuate anteriorly, straight and converging in about posterior ½; posterior angles obtuse, somewhat rounded; anterior angles somewhat produced, narrowly rounded; lateral margins narrow, without setæ; base margined, apex indistinctly so; disk convex, finely alutaceous; middle line well impressed except at ends, transverse impressions and basal foveæ almost obsolete. *Elytra* broadly oval, with reduced, broadly rounded humeri; margins, marginal setæ, and apical sinuato-truncation normal; disk convex, rather strongly alutaceous; striæ faint, broad, and vaguely defined, about as in *schwarzi* Darl.; each 3rd interval with 2 dorsal punctures about 2/5 and 1/10 from apex, usual anterior puncture lacking, extreme basal foveolate puncture (contiguous to margin) present. Metepisterna very short, outer edges no longer than anterior; inner wings atrophied. Body below alutaceous, sides of abdomen somewhat wrinkled. Hind tarsi normal, *i. e.* with 4th joint a little shorter than but otherwise similar to third; claws slender and rather elongate, each with 3 teeth on inner edge, outer tooth scarcely outside of middle, so apex of claw is long, slender, and simple. Male front tarsi very weakly dilated, each with 3 joints biseriately squammulose; middle

tarsi not modified; last ventral with 1 (♂) or 2 (♀) setæ each side. Length 3.8-5.0; width 1.6-2.0 mm.

HAITI: holotype ♂ (M. C. Z. no. 22032) and 11 paratypes from Mt. La Hotte, on and near summit (probably not below 7,000 ft.), Oct. 16-17; in leaf mold, moss, and rotting wood in damp forest.

Similar in color to *P. schwarzi* Darl., but differing from it, and I think from all other known Phlœoxena, by the loss of wings and consequent modification of elytra.

Apenes apterus n. sp.

Form as usual in Apenes *s. s.*, *sinuata* group; moderately shining purplish bronze, humeri with poorly defined brown spots, outer margin of elytra vaguely and irregularly brownish; lower surface piceous; appendages brown. *Head* large, about 6/7 width prothorax, but with eyes less prominent than usual; front finely alutaceous, finely and sparsely punctulate, not strigulose; antennæ rather short, middle joints scarcely longer than wide. *Prothorax* ¼ wider than long, subcordate; sides arcuate anteriorly, virtually straight and converging *or* slightly sinuate before posterior angles; latter either almost obliterated or very minutely subprominent; disk finely alutaceous, without evident punctulation, and with faint, sparse, transverse wrinkles. *Elytra* ½ wider than prothorax; humeri about as in winged species; striæ moderate, not punctate; scutellar stria present but rather variable; intervals slightly convex, lightly alutaceous, 3rd with 2 conspicuous punctures, at about 1/3 and 2/3 of length. Metepisterna with outer edges about ½ longer than anterior, shorter than in winged species; inner wings atrophied. Last joint labial palpus ♂ not nearly so dilated as usual in genus, scarcely wider than in ♀, with apical much shorter than inner margin; last ventral with 2 setæ each side in both sexes. Length (to apex elytra) 6.5-7.0; width 2.5 mm. or slightly more.

JAMAICA: holotype ♂ (M. C. Z. no. 22033), and 2 ♀ ♀ paratypes from main range Blue Mts., 5,000-7,000 ft., Aug. 17-19; under stones along the trail in the forest.

Differs from the other West Indian species of the *sinuata* group (*delicata* Darl. etc.) in lacking a subapical pale fascia, and in the atrophy of the wings.

Apenes ovalis n. sp.

Broad, with elytra more oval and more convex than usual; shining piceous without pale markings above; appendages and elytral epipleuræ reddish testaceous. *Head* large, a trifle over ¾ width prothorax; eyes but little prominent; front shining, very faintly alutaceous and punctulate, not strigose; antennæ rather short, middle joints a little longer than wide. *Prothorax* broad, 2/5 to ½ wider than long; sides broadly rounded, almost evenly rounded into base except for vague lobe just behind posterior seta each side; base also vaguely lobed; disk moderately convex, shining, very faintly alutaceous, faintly transversely wrinkled near middle. *Elytra* broadly oval, ½ wider than prothorax; striæ moderate, impunctate; scutellar stria rather short; intervals flat or faintly convex, polished, 3rd with 2 strong punctures. Metepisterna with outer edge about ½ longer than anterior, shorter than in winged species; inner wings reduced to minute vestiges. Male with apical joint labial palpus much less dilated than usual, apex scarcely more than ½ long as inner edge, scarcely wider than in ♀; ♂ with 1, ♀ with 2 setæ each side last ventral. Length (to apex elytra) 8.0-9.5; width 3.4-3.9 mm.

HAITI: holotype ♂ (M. C. Z. no. 22034) and 55 paratypes from La Visite and vicinity, La Selle Range, 5,000-7,000 ft., Sept. 16-23; in loose leaf mold and under other cover in wet cloud forest.

The wide, oval, convex elytra, and shining, unspotted surface give this Apenes a unique appearance which distinguishes it easily from the preceding (*aptera*), which is the only other species of the genus known to me from the West Indies in which the wings have atrophied.

Eucærus haitianus n. sp.

Stout, moderately convex; black; head and prothorax alutaceous, elytra shining, subiridescent; antennæ with 6 proximal joints, brownish, 7th more or less bicolored, 4 distal whitish; palpi, labrum, and legs brown, latter sometimes more or less testaceous. *Head* as in *insularis* Darl., with middle antennal joints about 3 times long as wide. *Prothorax* broadly cordate, slightly to distinctly more than

½ wider than long; sides briefly but distinctly sinuate before minute, somewhat obtuse basal angles; base lobed at middle, slightly or (usually) distinctly sinuate each side. *Elytra* with rather fine, entire, impunctate striæ; intervals barely convex; 3rd stria with fine setigerous puncture about 1/5 from base, 2nd with similar punctures near middle and a little before apex. Inner wings reduced as usual. Male with front tarsi slender, inconspicuously squammulose; ♂ with 1, ♀ with 2 setæ each side last ventral. Length (to apex elytra) 3.6-4.6; width 1.6-2.1 mm.

HAITI: holotype ♀ (M. C. Z. no. 22035) and 17 paratypes, mostly ♀ ♀, from Etang Lachaux, Oct. 26-27; taken by raking leaves from shady places on the bank into the water.

This species is closely allied to the Cuban *insularis* Darl. (Psyche 41, 1934, p. 120), of which I took 20 additional specimens at the type locality (Soledad), Aug. 2-12, 1934, but *haitianus* differs constantly in the brown labrum (testaceous in *insularis*) and in having a wider prothorax with posterior angles better defined and sides of base sinuate.

Pentagonica flavipes picipes n. subsp.

Structurally the same as typical *P. flavipes* (Lec.) of North America and Cuba (we have 33 specimens from Soledad, near Cienfuegos) and similarly uniform piceous black above, with fine elytral striæ, but with legs piceous or dark brown instead of testaceous or very pale brown and with labrum and base of antennæ somewhat darker also. The latter, however, are rather variable in true *flavipes*. The difference in color of legs is conspicuous even in the field, to the naked eye.

GREATER ANTILLES except CUBA: Jamaica: holotype ♀ (M. C. Z. no. 22036) from Kingston, Aug. 27; 1 paratype from Ocho Rios, Aug. 24; 5 paratypes from Port Antonio, March, E. A. Wight collector. Haiti: 1, not a type, from Miragoane, Oct. 30. Puerto Rico: 1, not a type, from S. T. Danforth.

Galerita montana n. sp.

Rather stout and convex; elytra costate; black or piceous, appendages dark, with 7 outer joints of antennæ dull

rufous. *Head* about ¾ width prothorax; eyes scarcely prominent; genæ rounded, nearly wide as eyes; front and vertex rugosely punctate except for small smooth area at middle anteriorly. *Prothorax* between subquadrate and subcordate, as wide to 1/10 wider than long, somewhat narrowed basally; sides strongly arcuate anteriorly, rather broadly sinuate before right or slightly acute, but narrowly rounded, posterior angles; disk moderately convex, rugosely punctate; middle line fine, transverse impressions not sharply defined; basal foveæ small and deep. *Elytra* rather broadly oval, with broadly rounded, somewhat narrowed humeri; sides just behind humeri more or less convex in outline, rarely almost straight, never subsinuate; apices strongly truncate, each subemarginate, with outer apical angles well defined, though obtuse; disk rather convex; each elytron with 9 moderate primary costæ plus a rather elongate scutellar costa (comparable to a scutellar stria in position); each primary intercostal interval with 2 much finer costæ, except only 1 secondary costa at suture and none, or only faint traces, in marginal interval; surface between costæ finely transversely rugulose. Metepisterna about ½ longer than wide; inner wings vestigial. Length 15.5-18 (to apex elytra, 14-16); width 5.2-6.2 mm.

HAITI: holotype ♂ (M. C. Z. no. 22037) and 14 paratypes from vicinity of La Visite, La Selle Range, 5,000-6,000 ft., Sept. 16-23; under stones in damp places on high slopes, but not on the plateau (except just at the edge) and not in cloud forest.

Somewhat similar to *Galerita nigra* Chev. of Mexico, but with outer apical angle of elytron much better defined and differing slightly in other ways. Probably more closely related to the Haitian *striata* Klug, of which we have a series from various localities below 5,000 ft., but larger and broader, with relatively slightly broader prothorax, and with elytra more evenly oval, without the post-humeral subsinuation of *striata*.

Pseudaptinus marginicollis fumipes n. subsp.

Structurally the same as typical Cuban *marginicollis* Darl. (*Psyche* 41, 1934, p. 126) except that the prothorax is slightly broader anteriorly in the new subspecies; color

also similar except the legs either entirely (7 specimens) or with only the tibiæ and apices of the femora (2 specimens) brown or blackish, while in typical *marginicollis*, of which I now have 28 specimens from the type locality (Soledad, near Cienfuegos, Cuba), the legs are always entirely pale testaceous.

HAITI: holotype (M. C. Z. no. 22038) (with legs entirely dark) and 4 paratypes (3, legs entirely dark; 1, with only tibiæ and apices of femora dark) from Ennery, Sept. 6-11; taken from piles of old flood debris beside the river; additional paratypes: 1, swamps north of Dessalines, Sept. 11; 1, Miragoane, Oct. 30; 1, Camp Perrin, Oct. 9; 1, Etang Lachaux, Oct. 26.

Zuphium haitianum n. sp.

Normal Zuphium form; piceous, a little more brownish on elytra, suture and medio-basal area of elytra and small vague sublateral stripes of prothorax usually faintly reddish; abdomen (irregularly) and legs testaceous; mouth parts including labrum, and antennæ rufo-testaceous. *Head* slightly (about 1/10) narrower than prothorax, shaped as in *cubanum;* front finely, not closely punctulate, finely alutaceous, more distinctly so on vertex; antennæ with joints 5 to 8 twice or slightly more times long as wide. *Prothorax* barely (not over 1/10) wider than long, sides of apex slightly less oblique than in *cubanum* (*i. e.*, prothorax more square shouldered); sides broadly arcuate anteriorly, strongly sinuate before the right or slightly acute posterior angles; disk moderately convex; middle line sharp, anterior transverse impression obsolete, posterior rather vaguely impressed; basal foveæ deep, rounded; whole pronotum finely, closely punctate and finely alutaceous. *Elytra* about 7/10 wider than prothorax, a trifle shorter and wider posteriorly than in *cubanum;* striæ moderate; intervals slightly convex, rather finely roughened and alutaceous. Length (to apex elytra) 4.0-4.7; width 1.4-1.6 mm.

HAITI: holotype (M. C. Z. no. 22039) and 9 paratypes from Etang Lachaux, Oct. 26-27; taken by raking dead leaves from shady places into the water.

Duller and much more finely punctate on head and prothorax than *cubanum* Liebke, of which we have 29 speci-

mens from Soledad, near Cienfuegos, Cuba. In Liebke's key to the American Zuphium (*Revista Ent.* 3, 1933, pp. 461-) *haitianum* runs to *columbianum* Chd., but the latter (which I have not seen) is evidently a pale species with only the head dark, and color is a rather constant character in this genus.

Pseudomorpha caribbeana n. sp.

Slender, parallel, very convex (even more so than in *angustata* Horn) ; castaneous, lower surface (except abdomen) and appendages more rufescent; whole upper surface finely alutaceous under high power, merely silky under lower power, moderately shining. *Head* 7/10 width prothorax; front with transverse row of moderate, setigerous punctures between eyes, otherwise very finely, sparsely punctate; pre-ocular lobes moderate, more explanate than in *angustata;* clypeal suture very fine; antennæ slender, reaching just beyond anterior coxæ. *Prothorax* 2/5 wider than long; apex truncate except anterior angles slightly prominent; sides broadly, almost evenly arcuate, with fine margins; basal angles rounded; apex margined, base not; disk finely, sparsely punctate and pubescent; middle line excessively fine; base not impressed, baso-lateral impressions completely absent. *Elytra* probably no wider than prothorax (slightly distorted by pin), elongate; sides parallel; apices rounded-truncate; suture not elevated; each elytron with 9 rows (beside the marginal fringe) of setigerous punctures, no special rows coarser than others; punctures so widely spaced in the rows that at first glance the elytra appear punctured at random; surface otherwise impunctate. Length 7.2; width 2.7 mm.

HAITI: holotype, probably ♀ (M. C. Z. no. 22040), unique, from Port-au-Prince, May, 1927, G. N. Wolcott collector, received from Mr. André Audant.

This is the first species of subfamily Pseudomorphinæ to be known from the West Indies. It is a very distinct species. In Notman's key to the species of Pseudomorpha (Proc. United States Nat. Mus. 67, 1925, Art. 14, pp. 14-15) the Haitian species runs to *confusa* Notman, but, as compared with the description of *confusa, caribbeana* is smaller (*confusa,* 10.25 mm.), much more convex, with relative-

ly wider head and narrower prothorax, and differs somewhat in other ways. Notman described *confusa* from a unique ♀ from the British Museum supposed to come from Australia; since Pseudomorpha is otherwise entirely confined to a small part of America, however, the Australian record is probably erroneous.

BEETLES ASSOCIATED WITH THE MOUND-BUILDING ANT, *FORMICA ULKEI* EMERY

By Orlando Park

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The mound-building ant, *Formica ulkei* Emery, has been reported as far west as South Dakota to Nova Scotia and New Brunswick (Wheeler, 1926; Holmquist, 1928). It is recorded from Wisconsin (Burrill and Smith, 1918) and Illinois, and is apparently abundant in northern Ohio[1] where its range merges with that of the eastern mound-builder, *Formica exsectoides.*

In Illinois *ulkei* is at present known only from the Chicago Area where it is well established in two localities (Palos Park and Palatine). In both places the numerous mounds, varying from young nests of less than a foot in diameter up to old hills more than four feet across, are found within the upland oak-ash-hickory forests, where they tend to follow the forest margins and clearings.

These ant mounds present an infinite array of problems which remained uninvestigated until 1926. Since then, a literature upon these Illinois mounds has steadily accumulated, including the life history and behavior of the host ant (Holmquist, 1928a), hibernation (Holmquist, 1928b; Dreyer, 1932), distribution of the nests (Dreyer and T. Park, 1933), and the species of arthropods associated with the host ant (Park, O., 1929; Park, T., 1929).

Among the numerous arthropods associated with ants the myrmecocolous beetles are numerous, both in species and individuals. Many of these beetles are nest scavengers,

[1]I am indebted to Dr. C. H. Kennedy for personal communication upon the Ohio distribution of *Formica ulkei* and *exsectoides.* The latter species is reported from Iowa (Wickham, 1900) and Indiana (Blatchley, 1910) so that the actual distribution of these two closely allied ants can not be certainly known until a carefully planned survey can be made. Both *ulkei* and *exsectoides* are present in the Chicago Area, however; a small mound was investigated, and workers preserved, near Smith, Indiana on August 27, 1934. These ants I sent to Dr. M. R. Smith who determined them as *Formica exsectoides.*

but the majority probably strike at the vitality of the society by feeding upon the host brood. The ant brood appears to be especially stimulating and may be infrequently raided by species which may or may not live in the nest (Park, 1933a), attacked by tolerated nest predators (Park, 1932b), or assiduously licked or devoured by highly specialized commensals and temporary ectoparasites (Park, 1932a, 1933b).

In the following table the beetles associated with *Formica ulkei* are listed with their seasonal range as far as known for the nests, and authority for the data.

From the above table we find that ten families and fifteen species of beetles have been reported from nests of *F. ulkei*, fourteen of which have been recorded from the Illinois mounds. In passing, mention should be made of the activity of these beetles during the last three weeks of May. Individuals were especially numerous during this period; two species, *Atheta polita* and *Batrisodes globosus* made repeated short flights of several inches on the evenings of May 12 and 13, and the syrphid flies of the genus *Microdon*[3] pupated on the mornings of May 17 and 18. This seasonal activity is in general agreement with the maximum appearance of species and individuals of Coleoptera in the Chicago area (Park, 1930), as well as that of isolated or specialized communities, e. g. beetle population of fungi (Park, 1931).

Formica ulkei and *F. exsectoides* are not only related taxonomically, but ecologically they are very similar and it is interesting to observe identity of some, and ecological equivalence of other, myrmecocoles from the mounds of these two species of hosts. The following table (Table II) lists those species said to occur in the *exsectoides* nests as far as I have been able to ascertain from the literature.

So far, no true guest (symphile) has been reported from either *Formica ulkei* or *exsectoides* nests. A comparison of tables I and II shows that three species, *Tachyura incurva, Megastilicus formicarius,* and *Hetærius brunneipennis,* are common to both host ants, and the species of

[3]These flies are at present being determined, and the data concerning their behavior in the nest, and pupation data are to be given later.

TABLE I

Coleoptera associated with Formica ulkei

Family	Species	Seasonal record with host	Citation
Carabidæ.....	Tachyura incurva..... (Say)	All year.....	Holmquist, 1928 Park, O., 1929
.....	Clivina bipustulata.... (Fab.)	May 7.....	Present report
.....	Amara polita LeC.....	April 11, May 7.....	Holmquist, 1928 Present report
.....	Harpalus pleuriticus..... Kirby	February 24....	Holmquist, 1928
Leptinidæ.....	Leptinus testaceus..... Mueller	October 6.....	Park, O., 1929
Staphylinidæ...	Gastrolobium bicolor..... (Graves)	May 7 to August 20....	Present report
.....	Atheta polita.... Melsh.	March 1 to October 6....	Park, O., 1929 Present report
.....	Megastilicus formicarius.... Casey	March 1 to August 4.....	Holmquist, 1928 Park, O., 1929 Present report
Pselaphidæ.....	Batrisodes globosus..... (LeC.)	All year..... [2]	Holmquist, 1928 Park, O., 1929 Present report
Histeridæ.....	Hetærius brunneipennis. Rand.	May 7.....	Present report
Cucujidæ.....	Cathartus advena..... (Walt.)	October 6.....	Park, O., 1929
Phalacridæ.....	Stilbus probatus..... Casey	September 13 June 2.....	Present report
Elateridæ.....	Melanotus communis..... (Gyl.)	August 6.....	Park, O., 1929
Scarabæidæ....	Phyllophaga horni..... Smith	October 6.....	Park, O., 1929
Chrysomelidæ..	Coscinoptera dominicana.... (Fab.)	Wisconsin record.....	Burrill and Smith, 1919

[2]*Batrisodes globosus* (Lec.) is probably the only species of this genus so far reported from these nests of *Formica ulkei*. In 1929 I reported that *B. denticollis* Casey was also present, but subsequent study and collection has proven that the latter were all females of the former species. Holmquist (1928) in addition reported the presence of a third species, *B. spretus* Lec. and, although I have not examined this latter material it is possible that this record also refers to females of *globosus*. Extensive and intensive collecting in these mounds since 1929 has never yielded either *B. denticollis* or *B. spretus*, although *B. globosus* is almost always to be had in numbers.

Table II

Coleoptera reported from nests of Formica exsectoides

Family	Species	Citation
Carabidæ	Bembidion quadrimaculatum. (Linn.)	Schwarz, 1889
.....	Tachyura incurva (Say) ...	Schwarz, 1889, 1890 Ulke, 1890
Staphylinidæ	Edaphus nitidus LeC.	Schwarz, 1889
.....	Megastilicus formicarius ..... Casey	Schwarz, 1889 Wickham, 1900 Blatchley, 1910 Wheeler, 1926
.....	Nematolinus longicollis ..... (LeC.)	Schwarz, 1889
.....	Diochus schaumi Kr.	Schwarz, 1889
.....	Goniusa obtusa (LeC.) ...	Schwarz, 1889
Pselaphidæ	Batrisodes scabriceps ..... (LeC.)	Leng, 1928
.....	Batrisodes fossicauda ..... Casey	Wickham, 1900
.....	Cedius ziegleri LeC.	Schwarz, 1889 Leng, 1928
Histeridæ	Psiloscelis harrisi LeC.	Schwarz, 1889
.....	Hetærius brunneipennis ... Rand.	Schwarz, 1889 Liebeck, 1891 Wickham, 1900
Anthicidæ	Anthicus melancholicus ... Laf.	Dury, 1903 Wickham, 1900
Monotomidæ	Montoma fulvipes Melsh. ..	Wickham, 1900
Scarabæidæ	Euphoria inda (Linn.)	Wheeler, 1908
.....	Cremastocheilus canaliculatus .... Kirby	Wheeler, 1908
.....	Cremastocheilus castaneæ ..... Kirby	Wheeler, 1908

Batrisodes are probably ecologically equivalent. Such identity and parallelism when investigated more fully should further our imperfect understanding of host-guest interrelations within the nest biocoenose.

In such a populous community as a *F. ulkei* nest it is expected that many species stray into the mound, or are taken in by the ants. The cases of *Harpalus pleuriticus, Amara polita* and *Cathartus advena* may indicate such accidental circumstance, penetration for purposes of hibernation, or passing the day within the nest in the case of a nocturnal form such as *polita*. Other species may pass a part of their life cycle in the mounds, either accidentally (*Melanotus communis*), or habitually (*Microdon* larvæ). The larvæ and pupæ of *Phyllophaga horni* and other species not yet determined are rather abundant in the nests. Their presence may or may not be significant, but since many other scarabæids are myrmecocolous, exclusive of the Cremastocheilini, (Riley, 1882; Smith, 1886; Schwarz, 1889; Wickham, 1892, 1896; Wheeler, 1908, 1926; Donisthorpe, 1927) more investigation is needed in the case of the May-beetles.

The presence of the chrysomelid larvæ of *Coscinoptera dominicana* in the Wisconsin ulkei mounds (Riley, 1882?; Burrill and Smith, 1919) is interesting, and suggests further study since the genus in North America, and in England and Europe related genera, are known to be myrmecocolous in the larval and pupal stages (Riley, 1882; Schwarz, 1896; Wickham, 1898; Wheeler, 1926; Donisthorpe, 1902, 1927).

The single record for *Clivina bipustulata* was probably accidental, and the beetle was undoubtedly stimulated by the darkness and moisture of the nest. It is a geocole by habit, burrowing in moist earth and mud margins of streams or marshes, and has been found to be nocturnal (Park and Keller, 1932). When taken, the beetle was a foot beneath the dome of the nest, in wet clay soil with a temperature of 16 C.° In a laboratory nest it buried during the day and was not found by the host ants. It was attacked and readily put to flight by such nest predators as *Megastilicus formicarius*.

Three of the small phalacrid beetle, *Stilbus probatus*,[4] were taken on September 13, 1932, from one part of a deep *ulkei* gallery, and six more from another nest at a depth of four feet on June 2, 1934. Their presence with *ulkei* was the only datum obtained, however, the records are of interest.

The small *Atheta polita*, belonging to a tribe of staphylinids which includes many habitual myrmecocoles, is an all year resident of the *ulkei nest*. However, little is known concerning it. It is capable of making short evening flights, and in artificial nests easily evades the ants. Its food and ecological position within the nest society are unknown. Although it occurs elsewhere in some abundance, its continual presence with *ulkei* can hardly be accidental.

The exact status of another staphylinid, *Gastrolobium bicolor*, is also uncertain. It has been taken twice in the nests. A male and female were obtained on May 7, and a third beetle on August 20, 1932. These records are probably accidental since the species is widely distributed over the Chicago Area, where it inhabits moist forest floors and stream margins beneath logs and stones. In the laboratory the beetles avoided the host ants, running away with uplifted abdomens. On the night of May 18 one of the beetles attacked and dismembered and devoured three *Batrisodes globosus*. Since the latter fills a constant niche in the *ulkei* society we see the possibilities for disturbing the equilibrium of the biocoenose arising from even accidental penetration by a non-myrmecocolous predator.

The role of *Leptinus testaceus*[5] is poorly understood, chiefly due to its presence in such a variety of habitats. It is found within the nests of small forest mammals, bird nests, certain of the social wasps, bees and ants and in isolated log mold, not harboring mammals. Such a list provokes inquiry as to the natural niche of the species, especially in view of the probable ectoparasitism of related

[4]The first lot were collected by the writer, and the second group by Mr. Strohecker. Both lots were independently determined by the writer, and by Mr. Emil Liljeblad of the Field Museum.

[5]In 1929 the following data were unfortunately omitted. Donisthorpe (1909) records three collectings of *Leptinus testaceus* with *Lasius fuliginosus* but states that it is usually taken in nests of bees, birds, moles and small rodents.

leptinids, and has been discussed elsewhere (Park, 1929). These delicate animals, eyeless, extremely flattened, and of pale yellow color were apparently unmolested by the *ulkei* workers, but were attacked and devoured by nest predators mentioned later. The food of this species remains uncertain, but as far as its presence with *ulkei* is concerned, it appears to be a tolerated form, one of the loricate synoeketes.

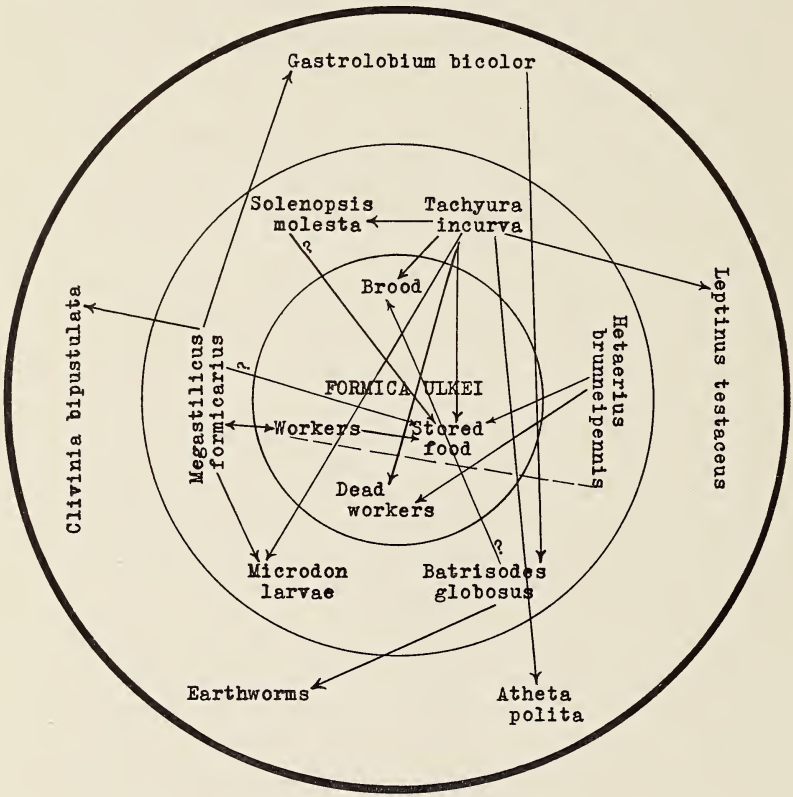

FIG. 1. Diagram of some of the food interrelations among the myrmecocoles of *Formica ulkei* Emery. The inner circle encloses the host species and its food supply; the intermediate circle contains those species where a definite association is known to exist with the host; the outer circle is reserved for either accidentals or those forms where the relationship is still obscure.

The arrows point to the food and away from the feeder. The broken line indicates regurgitation of food by the host workers.

The small predaceous carabid, *Tachyura incurva,* on the other hand, is a year round occupant of the *ulkei* mounds, and is the most consistently abundant myrmecocole in the nest and trophoporic field. Schwarz (1889) thought the species an accidental visitor of ant nests, but later, with accumulation of data, reversed his opinion (1890).

In the laboratory nests the food of *incurva* is highly diversified. The beetles feed upon dead or disabled individuals of their own species, dead and disabled host ants, the host brood, and dead insects brought into the nest by the worker ants. In addition, the ulkeicoles are also attacked where the species offers little resistance (*Leptinus testaceus, Atheta polita*), or are eaten when injured (*Microdon* larvæ, queens of the lestobiotic guest ant, *Solenopsis molesta*). Finally, *incurva* fed upon the sugar water and honey placed in the artificial nests.

The nest conditions are apparently very favorable for the species and its general behavior has been discussed elsewhere (Park, 1929). It appears to be a tolerated form, or at least very successful in avoiding persecution by the host ants. Its catholic feeding habits fit it for the general role of nest scavenger, although it may be strictly predaceous upon occasion.

We now turn to an habitual myrmecocole, the actively persecuted staphylinid, *Megastilicus formicarius.* It is common in the nests of *F. exsectoides* (Schwarz, 1889; Blatchley, 1910; Wickham, 1900), and Wheeler (1926) discusses the relation of this latter host to the beetle upon (1) the red and black coloration and ant-like appearance of the species, (2) its defensive mechanism, which is similar to that of the related staphylinid *Myrmedonia,* consisting of emitting a volatile whitish fluid from the raised tip of the flexible abdomen, and (3) that the ants kill the beetle within a few hours when in laboratory nests, but are eluded easily by the beetles in nature. He found *formicarius* too feeble to kill living *exsectoides* workers.

Formicarius has been taken repeatedly from the *ulkei* nests and studied in the laboratory. The above summary of its relations with *exsectoides* has been found to hold in general for *ulkei.* However, in the artificial nests of *ulkei, formicarius* is an agile and wary species. The ants attack

the beetles whenever the opportunity is presented, but with very indifferent success. When attacked the beetles usually wheel to present the posterior end to the ant and raise the apex of the abdomen. At times the beetle merely crouches, with the head lowered and antennæ pressed back and in to the body, while the abdomen is raised and its apex directed forwards over the sloping elytra. Both maneuvers serve the same purpose, the ant recoiling and behaving as though temporarily stunned. Meanwhile, the beetle escapes.

Infrequently, upon meeting an ant the *formicarius* would not raise the abdomen but would dodge away and attempt flight, either by running or by crouching and then crawling away between the ant's legs as the ant attempted to bite the beetle. If this retreat was blocked then the abdominal defense was successfully employed.

The worker *ulkei* almost always attacked these beetles at the slender neck or peduncle between the head and pronotum. Once such a hold was obtained the outcome was more doubtful. I have witnessed such combats where the ant had seized a beetle by the neck and the two struggled back and forth. One of these encounters lasted twenty-five minutes continuously, with the beetle thrusting the apex of its abdomen at the ant's head. At the end of this time the ant still held the beetle's neck between her mandibles, but appeared inert otherwise. The ant's jaws were pried apart and the *formicarius* ran off, unharmed, but the ant proved to be dead. The same beetle was then examined but the integuments were not even scratched. Of course, the ant may have been an enfeebled individual but we think that it was killed by the beetle's abdominal secretion. The protection of *formicarius* from *ulkei,* then, lies in (1) a hard exoskeleton, (2) agility, and (3) a defensive abdominal secretion which, under certain conditions at least, may be lethal.

At times a *formicarius* would be killed, when placed in a small watch glass with five or six workers. This usually happened during the night, and although the beetle would be dismembered, it was not eaten.

So far *Megastilicus formicarius* has not been observed to feed on dead host ants, although this is to be expected.

It does feed upon injured *Microdon* larvæ, chewing the flesh of wounds and licking the exuding body fluids. It has also been observed to attack and put to flight the larger staphylinid, *Gastrolobium bicolor*. *Formicarius* drinks from small pools of water in the artificial nests. In drinking, the head is lowered and the fore-legs spread apart; the water is pushed into the mouth by the maxillæ and labium, while the mandibles are held widely agape and partly immersed in the liquid.

After feeding, *formicarius* cleans itself elaborately. The vertex is rubbed by the prothoracic tarsi, usually both legs scraping together. The antennæ are cleaned by pushing them between the slightly gaping mandibles from above. The antennæ are then pulled back and forth, usually one at a time, in part by their own activity, but also by the fore-legs which push them upwards. After the antennæ are cleaned they are withdrawn and the prothoracic tarsi and tibiæ are thrust between the jaws, one leg at a time, and drawn back and forth rapidly. The front legs may also be rubbed together, after the manner of so many flies. The left elytron is scraped by the left middle leg and the right elytron by the right middle leg. The dorsal surface and sides of the abdomen are scraped by the metathoracic legs. Finally the wings are unfolded and held so that they parallel the abdomen, and moved from time to time. When the wings are retracted again, this action is aided chiefly by the raised apex of the abdomen.

Another characteristic myrmecocole is the small pselaphid, *Batrisodes globosus*. It lives all the year round with *Formica ulkei* as one of its most abundant guests. This beetle, however, is reported with many kinds of ants. Blatchley (1910) records the species "in the large cone-shaped nests of ants," which may refer either to *ulkei* or *exsectoides*. Schwarz (1889-1890) reported this pselaphid from nests of *Camponotus pennsylvanicus, Lasius americanus,* and *Cremastogaster lineolata;* Wickham (1898-1900) found it with *Camponotus herculeanus, Lasius americanus,* and *Lasius aphidicola*. Park (1932b) observed it with *Lasius americanus,* and I can now add the following hosts:[6]

[6]I am indebted to Dr. Thomas Park and Dr. M. R. Smith for determination of these host ants.

Springfield, Illinois (April 25) with *Lasius americanus;* Cambridge, Wisconsin (May 26) with *Camponotus noveboracensis;* Madison, Wisconsin (May 26) with *Lasius americanus.* The species, then, is known to have a number of hosts, but is not habitually taken with ants, since it is common in moist, decaying log mold in rich forests throughout the year.

The *ulkei* workers tolerate this pselaphid in their nests, seldom giving more than a wave of the antennæ when passing a beetle. On their part, the beetles usually walk on when passing a worker, and seldom crouch to the soil. Only once was an ant observed to attack *globosus.* On this occasion the ant picked up the beetle by surrounding it with her legs, and then attempted to bite it. The beetle however easily escaped, and walked off without the ant giving chase. Although rare, such an incident shows that the host will attack this normally tolerated form.

In 1929 the writer was unable to discover what *globosus* fed upon in the *ulkei* nest. Since then further investigation has produced a great deal of information. When *globosus* is isolated in artificial nests with earthworms, the beetles feed avidly on the latter, biting the worm's integument and eating the slime secreted. Such feeding, when examined under magnification, showed that the pselaphids bit and gnawed the worm's cuticula in the manner of predaceous carabids and staphylinids. They planted their foretarsi upon the worm, bit savagely and then pulled upwards, bracing their legs against the writhing worm. When entangled in the slime, the beetles struggled and eventually freed themselves, extricating one tarsus after another. Wounds made in the worm's body wall were readily attacked, as were also amputated segments placed in the nests. The twisting worms did not deter their feeding, and as many as three pselaphids per square centimeter of earthworm surface have been seen feeding, under laboratory conditions. When one pselaphid approaches another feeding beetle too closely, the latter pauses long enough to bite at the intruder, and usually drives it away.

The pselaphids may feed for thirty minutes. When through eating they clean their antennæ and fore-legs as noted previously for *Megastilicus.* After cleaning them-

selves they may or may not resume feeding. Holmquist (1928a) listed two species of earthworms in the *ulkei* nests, and since these oligochaetes are abundant in the wet soil of the nest rich in organic débris, they may form a part of the normal diet of *globosus*.

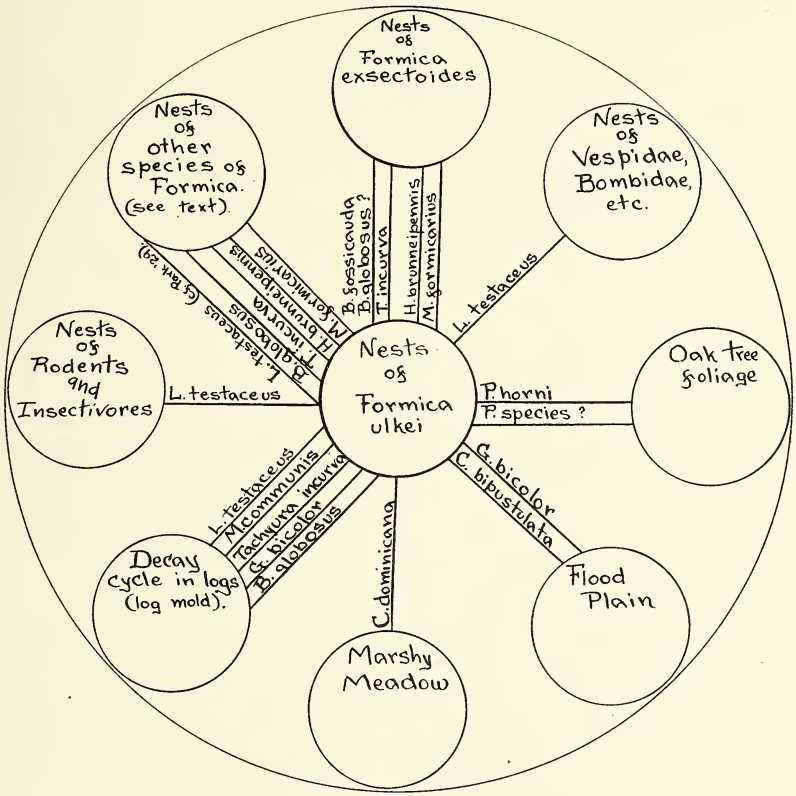

FIG. 2. Diagram of some of the habitat interrelations among the myrmecocoles of *Formica ulkei* Emery.

When a number of these pselaphids are isolated without food in an artificial nest the first individuals to die are summarily attacked by their cannibalistic companions who bite and lick at the integuments and especially at the articular membranes. From these data it is clear that *Batrisodes globosus* is a predator, attacking other ulkeicoles, and

may also act as a nest scavenger. Since this same species has been shown to eat the brood of *Lasius americanus* (Park, 1932b), it may well attack the young of *Formica ulkei.*

The last beetle to be discussed is the histerid, *Hetærius brunneipennis.* The genus *Hetærius* numbers some twenty-two species, all habitually found with ants. The ecology of most of the species remains unknown but *brunneipennis* has been well studied (Hamilton, 1888; Schwarz, 1890; Liebeck, 1891; Wickham, 1896, 1900; Wheeler, 1908, 1926). Wheeler assigns the genus to the symphiloid synoeketes (1926) and has given us our only comprehensive study of this species (1908). The following observations were made upon the *brunneipennis* found with *Formica ulkei,* and bear out the general conclusions of others concerning this beetle with different host ants.

May 11: a worker ant and one histerid placed in a petri nest at 2:00 P.M. The histerid letisimulated for five minutes and then began walking slowly ahead on the last two pair of legs, rubbing the anterior legs together at the same time. It walked in this manner for thirty minutes, covering twelve centimeters. During this time frequent halts were made to clean the legs and body. The front legs were drawn over the pronotum and head and then pushed slowly through the gaping mandibles. At intervals in its slow progress it would stop and rear up on the extended front legs. At 4:15 P.M. a dead ant was added. The histerid promptly mounted the latter but did not molest it. The living worker ran over to the beetle and licked the glandular area on the right posterior pronotal angle. While the host attended the beetle the latter remained motionless, not even withdrawing its antennæ. At 4:25 the histerid was given a thorough licking by the ant. The latter first licked the beetle's head and mouth parts and while doing so regurgitated a drop of liquid on to the beetle's mandibles. After this prolonged ministration the ant rolled the beetle over and bit twice at the right posterior pronotal angle again. The ant then licked the dorsal and ventral surfaces of the prothorax. This licking, fondling and feeding of the beetle continued for twenty minutes. During this period

the histerid remained passive with legs and antennæ outstretched.

On the following day the histerid was discovered in the morning gnawing spasmodically on the dead ant's left posterior leg at the femorotibial joint. Through the day this gnawing continued, and by 4:00 P.M. it had chewed free a small strand of the articular membrane and was persistently enlarging the perforation.

This isolated account is typical of the beetle's activities within the laboratory nests, and we conclude that the histerid is thoroughly adjusted to the *ulkei* biocoenose, where it is attended, cleaned, fed upon regurgitated foods by the worker ants and also eats dead insects in the nest. The workers in return for these many attentions bestowed upon the histerids, seem greatly stimulated by the glandular pronotal areas. This species is the most perfectly adjusted to *ulkei* of any of the guests so far reported.

Observation of these fifteen species of beetles associated with *Formica ulkei* show us that the several species eat many things and are in different categories with respect to food competition and adjustment to the host. The complexity of food interrelations for this very imperfectly understood biocoenose is suggested by the diagram in the accompanying figure (Fig. 1).

Another problem involved is the ecological role played by each form in the nest. The position of a species is usually a definite one with respect to its relation with other nest inhabitants, although this status is frequently different in its several life history stages. Our grasp of many of the larger community problems may depend to an unknown degree upon the amount of accurate information we have on the smaller, microhabitats, and therefore a great deal of autecological data must be had before we can really understand a large unit. The following table (Table III) is a tentative arrangement to indicate the role of these fifteen forms in the *ulkei* nest, the technical terms following the system employed by Wasmann and later modified by Wheeler (1926).

Since many of these species have a facultative role, and consequently occupy both the *ulkei* nest and other habitat niches, the complexity is greatly increased. These possible habitat interrelations are shown for some of the forms in Fig. 2.

Table III

Ecological Status of Ulkeicoles

	Species	Status
1.	Harpalus pleuriticus	Chance occurrence.
2.	Amara polita	Chance occurrence.
3.	Clivina bipustulata	Chance occurrence.
4.	Gastrolobium bicolor	Chance occurrence.
5.	Cathartus advena	Chance occurrence.
6.	Melanotus communis	Pupa. Chance occurrence.
7.	Stilbus probatus	Status problematical.
8.	Phyllophaga horni	Facultative larval stage?
9.	Coscinoptera dominicana	Facultative or Habitual larval stage?
10.	Megastilicus formicarius	Habitual Synecthran.
11.	Atheta polita	Facultative Synecthran or Synoekete?
12.	Tachyura incurva	Facultative Synoekete.
13.	Leptinus testaceus	Status problematical: Facultative Loricate Synoekete.
14.	Batrisodes globosus	Facultative Mimetic Synoekete.
15.	Hetaerius brunneipennis	Habitual Symphiloid Synoekete.

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PSYCHE

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TWO NEW THYSANOPTERA FROM THE UNITED STATES

By J. Douglas Hood

University of Rochester, Rochester, N. Y.

The types of the two new species described below are in the author's collection.

Tæniothrips vaccinophilus sp. nov. (Fig. 1)

Female (macropterous). — Length about 0.88 mm. (distended, 1.01 mm.). Color clear pale yellow, with tip of abdomen and sides of thorax just perceptively darker; antennæ concolorous with paler portions of body in segments I and II, III similarly pale at base, lightly shaded with gray distally, IV pale in basal third or fourth, more darkly shaded with gray beyond but somewhat paler in apical portion, V somewhat darker than IV, more briefly pale at base and with the short pedicel gray, VI about concolorous with darker portions of V, somewhat paler basally, VII and VIII uniform gray but paler than VI; wings of fore pair nearly colorless in basal fourth, yellowish beyond, the anal area (scale), a narrow line along posterior margin in distal three-fourths, and a broader patch along anterior margin of second fourth, light gray; ocellar pigmentation bright red.

Head about two-thirds as long as greatest postocular width, distinctly broader across eyes; cheeks smooth, narrowing only slightly to eyes, roundly converging to the distinctly narrower base, thus not swollen; occiput with about five faint transverse lines of sculpture, of which the anterior is the most distinct; vertex slightly elevated in the ocellar area, distinctly excavated between it and insertion of antennæ; frontal costa with an exceedingly minute V-shaped notch; interocellar setæ short and pale, about 13μ in length and somewhat shorter than postocellars, a similar but more minute pair of setæ near inner margins of eyes

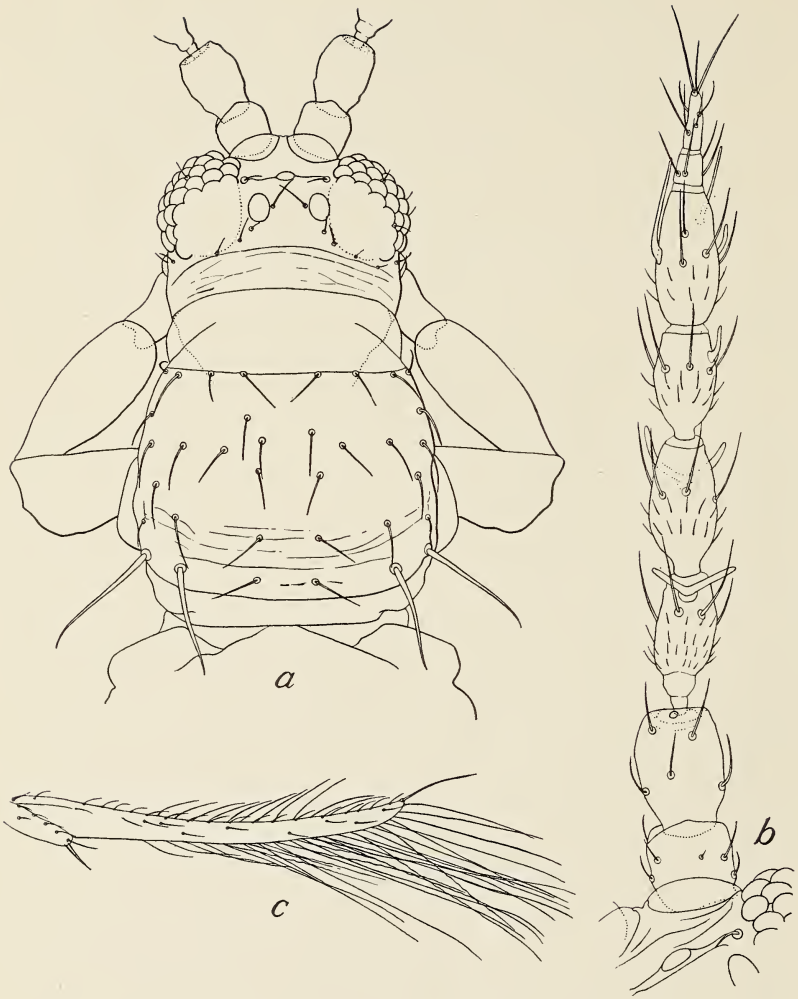

Fig. 1. *Tæniothrips vaccinophilus* sp. nov., ♀, holotype. *a*, head and prothorax; *b*, right antenna; *c*, right fore wing.

directly laterad of median ocellus; postocular and genal setæ minute and pale, two pairs of the former, three pairs of the latter. *Eyes* rather large and prominent, somewhat protruding, two-thirds as long as head and 0.8 as wide as their interval. *Ocelli* subequal in size, about 13μ in diameter, posterior pair about 18μ apart and 10μ from median ocellus, which is directed forward and overhanging. *Antennæ* three times as long as head, rather stout, segments III and IV with the usual forked trichomes short, IV and V with pedicel short. *Mouth-cone* about attaining posterior margin of prosternum (maxillary palpi not clearly visible in the type material).

Prothorax about 1.4 times as long as head and about 1.4 times as wide as long; pronotum almost smooth, with a few faint transverse lines posteriorly, of which one between the inner pair of major setæ is most distinct; all setæ pale yellow, the outer pair at posterior angles 50μ, inner 44μ, between the latter and midway between the heavy transverse line of sculpture and the posterior margin only *one pair of minor setæ,* these about 24μ apart and subequal to interocellars and a number of other setæ scattered over pronotum. Fore wings nearly 11 times as long as width just beyond scale, recurved at tip; setæ pale in color, anterior vein with a sub-basal group of three arising opposite distal half of scale, followed by a second group of three in the dark portion of wing and by three more in distal half of wing, the last two in the series closer together; posterior vein with three nearly equidistant setæ in distal half of wing; costal margin with about 16 setæ.

Abdomen of normal form, about 1.24 times as wide as pterothorax, nearly free of sculpture, *posterior margin of tergum VIII without comb;* tergum X not divided along median line; dorsal setæ on IX and X about 68μ long, those on IX much stouter.

Measurements of holotype (♀): Length about 0.88 mm. (distended, 1.01 mm.; head, length 0.065 mm., width across eyes 0.103 mm., width across cheeks 0.099 mm., width at base 0.093 mm.; eyes, length 0.044 mm., width 0.032 mm., interval 0.040 mm.; prothorax, median length of pronotum 0.092 mm., width 0.130 mm.; pterothorax, width 0.164 mm.; fore wings, length 0.423 mm., width just beyond scale 0.039

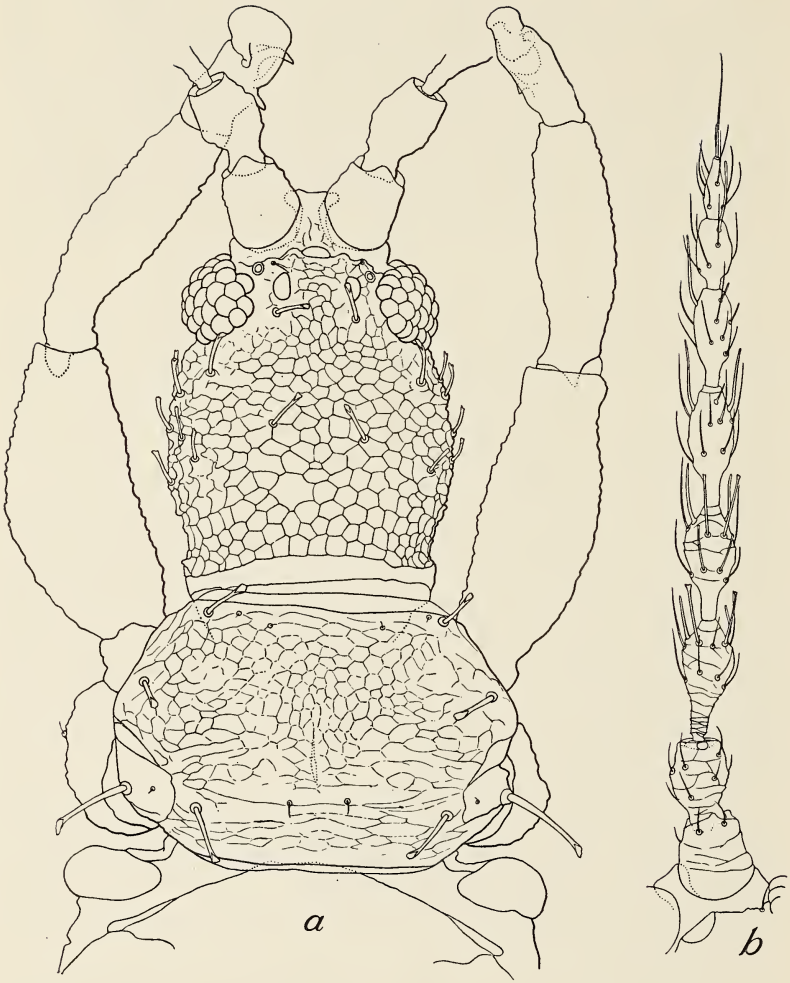

Fig. 2. *Eurythrips sculpturus* sp. nov., ♀. *a*, head and prothorax, paratype; *b*, right antenna, holotype.

mm., at middle 0.027 mm.; abdomen, greatest width 0.204 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	20	30	34	31	27	33	8	15
Width (μ):	22	23	17	17	17	17	7	5

Total length of antenna 0.198 mm.

Described from 9 females taken by the author on a species of Blueberry (*Vaccinium sp.*), at Canandaigua Lake, New York, May 27, 29, and 30, 1934 [Hood Nos. 567 and 568].

The assignment of this species to the heterogeneous collection of forms now reposing in *Tæniothrips* does not thoroughly satisfy me; yet I dislike to erect a new genus for it until a thorough study has been made of its relatives. The number of segments in the maxillary palpus cannot be determined with certainty from my material, though I strongly suspect that there are but two instead of the conventional three.

It is certainly a most distinct species. The small size, pale color, minute frontal notch, short abdominal setæ, and the absence of a comb from the eighth abdominal tergum are all important characters in its recognition; but the presence of only two minor setæ on the posterior margin of the pronotum, instead of the usual six or eight, is distinctive.

Eurythrips sculpturus sp. nov. (Fig. 2)

Female (brachypterous). — Length about 1.4 mm. Color of head, thorax, and legs bright yellow, all somewhat shaded with brown at sides, pterothorax darkened along anterior margin; abdomen brown, terga III-VIII each with the subbasal line darker and with a dark gray quadrate blotch occupying the basal half of the median fourth beyond the line, the tube blackish brown and much darker than rest of abdomen; pigmentation in fat-body maroon red, present in the ocellar region, in sides of head at base, sparingly in prothorax, and abundantly along sides of pterothorax and abdomen and in abdominal segment II, entirely wanting in tube and all appendages; antennæ about concolorous with head in segment I, II darker, especially at sides, III yellow, shaded with gray in expanded portion, especially at sides,

IV-VI with pedicels grayish yellow and the swollen distal portions gray-brown to blackish brown and successively darker, remainder of antennæ nearly or quite blackish brown and concolorous with tube, the pedicel of VII somewhat paler.

Head about 1.36 times as long as greatest width, which is at middle of cheeks; the latter decidedly rounded to near eyes, sharply constricted just behind eyes, and converging in basal third, with a somewhat wider and distinct basal collar; at this level the head is only slightly broader than at the postocular constriction; width across eyes about 0.9 the greatest width across cheeks; the latter roughened as seen from above because of rather heavy lines of reticulation which form distinct polygons over the whole surface of head, and with six pairs of pale, curved, expanded setæ about 18μ in length; postocular setæ expanded and curved at tip, 27μ long; a slenderer but otherwise similar pair of occipital setæ, 27μ long and 50μ apart, situated about midway between postoculars and base of head; vertex and occiput elevated, the former somewhat excavated in front for the reception of the forwardly-directed median ocellus, with a pair of strong postocellar setæ which are similar to occipitals, and a slender pointed pair directly between the vertical pores and the median ocellus. *Eyes* rounded, strongly protruding, coarsely facetted, only 0.22 as long as head, their length distinctly greater than their width, which is approximately half their interval. *Ocelli* subequal, posterior pair much farther apart than their distance from anterior ocellus, their diameter (15μ) about half their interval; median ocellus with its posterior margin in the same transverse line as anterior margin of eyes. *Antennæ* about twice as long as head, the four basal segments marked with weak lines of reticulation which are most distinct on II; III-VII subclaviform, the pedicels of about equal width but successively shorter on IV-VII, VIII narrowed at base; sense-cones long and slender, disposed on inner (and outer) surfaces of segments as follows: III 1 (1), IV 1 (1), V 1 (1^{+1}), VI 1 (1^{+1}); setæ long and slender, the major dorsal ones on II-VI knobbed. *Mouth-cone* short and broadly rounded, about attaining middle of prosternum.

Prothorax along median line of pronotum about two-

thirds as long as head, and (inclusive of coxæ) about 1.8 times as wide as long, with a short vestigial internal median thickening and a nearly straight thickening across posterior fourth, between posterior marginal setæ, this line bearing a pair of minute setæ (30μ apart) at middle; most of dorsal surface faintly subreticulate; epimeron not or only slightly fused with pronotum; anterior marginal setæ very minute, the others long, dilated and obliquely truncate at tip, the epimeral 46μ and longest, the others 32-34μ, coxals dilated apically but minute (13μ). *Pterothorax* slightly wider than prothorax; mesonotum with faint anastomosing lines over whole surface, these generally forming transversely elongate areas; metanotum polygonally subreticulate. *Legs* normal, fore tarsi with a small slender tooth; all femora and tibiæ distinctly reticulate and thus roughened in appearance. *Wings* short and pad-like, not attaining base of abdomen, fore pair with a single seta comparable in size and structure with posterior marginals.

Adomen large and heavy, about 1.6 times as wide as prothorax across coxæ, polygonally subreticulate in terga I-IX, except median portion of the last, distal portion of II-IX, and basal to the dark line across III-VIII; reticulation of I somewhat coarser than that of metanotum or of the other terga, the lines at sides of II and across middle of other terga minutely asperate; all major setæ at sides of segments I-VIII similar in form to postoculars and prothoracics, i.e., moderately stout, expanded and obliquely truncate apically, this giving them a somewhat golf-club-like form when seen from the proper direction, the lateral setæ on VII 60μ, on IX 107μ, dorsals on IX (76μ) scarcely hooked, terminal setæ pointed, 77μ.

Measurements (mostly of paratype,* ♀): Length about 1.3 mm. (fully distended, 1.4 mm.); head, length 0.213 mm., width across eyes 0.140 mm., width at posterior margin of eyes 0.125 mm., width at middle of cheeks 0.157 mm., width near base 0.130 mm.; eyes, length 0.047 mm., width 0.037 mm., interval 0.070 mm.; ocelli, diameter 0.015 mm., inter-

*In order that the coloration of the holotype might be preserved, it was deemed better to macerate the topotypic paratype in NaOH and to measure it. Accurate measurements are possible only in specimens so treated and then mounted to float free in balsam, without coverglass pressure.

val between posterior ocelli 0.030 mm., distance between anterior and posterior 0.018 mm.; prothorax, median length of pronotum 0.142 mm., width (inclusive of coxæ) 0.253 mm.; pterothorax, greatest width 0.266 mm.; abdomen, greatest width (at segment III) 0.415 mm.; tube, length 0.165 mm. (in holotype 0.139 mm.), width at base 0.071 mm. (holotype, 0.063 mm.), at apex 0.027 mm. (holotype, 0.027 mm.).

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	43	55	67	63	70	55	40	41
Width (μ):	41	34	31	29	27	24	20	13

Total length of antenna 0.434 mm.

Male (brachypterous). — Length about 1.0 mm. (partially distended 1.11 mm.). Color and structure essentially as in female, but with the abdomen, particularly segment IX, paler, this being nearly yellow and darkened at sides with brown; transverse chitinous line near posterior fourth of pronotum heavier and darker, elevated, somewhat overhanging posteriorly, weaker between the two setæ at middle; lateral seta on segment IX of abdomen short (32μ).

Measurements of allotype (♂): Length 1.0 mm.; head, length 0.151 mm., width across eyes 0.110 mm., width at posterior margin of eyes 0.099 mm., width at middle of cheeks 0.125 mm., width near base 0.114 mm.; eyes, length 0.033 mm., width 0.024 mm., interval 0.062 mm.; postocular setæ, length 0.027 mm.; prothorax, median length of pronotum 0.090 mm., width (inclusive of coxæ) 0.200 mm.; anterior lateral setæ, length 0.020 mm., midlaterals 0.033 mm., epimerals 0.036 mm., posterior marginals 0.034 mm.; pterothorax, greatest width 0.196 mm.; abdomen, greatest width (at segment III) 0.249 mm.; tube, length 0.099 mm., width at base 0.049 mm., at apex 0.023 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	37	43	52	48	53	43	32	34
Width (μ):	33	28	26	25	23	20	18	12

Total length of antenna 0.342 mm.

Described from three females and three males, taken by Dr. J. W. Folsom, at Tallulah, Louisiana, April 2 (1 ♀, paratype), May 11 (1 ♀, holotype, and 1 ♂, allotype, Hood No. 566), and October 4, 1934, "in humus".

It is not difficult to distinguish this interesting little spe-

cies from its congeners. The distinct dorsal reticulation, the oblique truncation of the dilated tips of the stout setæ, and the transverse pronotal thickening are all peculiar to it. It bridges beautifully the gap which has previously existed between the group comprising *Sagenothrips, Terthrothrips, Glyptothrips* (and possibly one or two other genera) and that portion of the *Trichothrips* group which culminates in *Malacothrips* and *Eurythrips*. On the basis of the definition alone of *Sagenothrips* it would seem more properly assignable to that genus; but I find little excepting sculpture to exclude it from the older genus *Eurythrips*. Furthermore, in the series of *Eurythrips* before me, a complete transition is observable in sculpture from those species which are nearly glabrous above to such species as the present one, in which the dorsal anastomosing lines take on a polygonal disposition and become pronouncedly elevated. Differences in sculpture which are of degree rather than of kind are seemingly never of generic, and certainly never of tribal, value in the Thysanoptera. Our classificatory scheme of the group contains many super-generic terms which have been proposed as the result of an eager and premature search for differences, untempered by an equal assiduity in a search for similarities.

ORBWEAVERS' DIFFERENTIAL RESPONSES TO A TUNING-FORK

By F. L. Wells

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Patent factors in this behavior situation are, species and (developmental) age of the spider, position of the spider with reference to the nest, position of fork with reference to spider. Probably significant, but in the present circumstances less readily observed factors include general tensional state of spider (as nutritional), conditions of temperature and illumination (season, night and day; present observations mostly of daytime behavior), individual and sex differences.

Present reference is to females half grown or more, unless otherwise specified. Species observed include mainly the common: *Epeira insularis* (30),[1] *E. trifolium* (15), *E. domiciliorum* (8), *E. stellata* (6), *E. cavatica* (40), *Argiope aurantia* (40), *A. trifasciata* (15). *Cavatica* was observed in northern New Hampshire, others mainly in eastern Massachusetts. The earliest was of a young *A. aurantia* (7-7-35); the last of an old *A. trifasciata* (11-9-35). The fork was an ordinary Hartmann, designated C, 128. Normally it was sounded by striking smartly against the examiner's knee or forearm. To control-observations with the fork silent, all spiders compared were, with the rarest exceptions, inert (Peckham, p. 391, also Peters, '31, p. 698; Grünbaum, pp. 288-290). Neither did the retreat-dwellers respond to illumination by pocket flashlight, incidental to observation and photography at night. All observations were in the field, with minimal disturbance of spider's domestic economy.

The patterns of behavior distinguished, and the circum-

[1]Numerals are approximate number of individuals observed; some on one occasion only, others repeatedly, and over several weeks. Essential help in taxonomy and nomenclature is received from Professor Nathan Banks and Miss E. B. Bryant.

stances in which they appeared, are in general as follows:

Dropping: As often reported, the spider, on the near approach of the fork, drops any distance from a few inches, to the substratum; returns after a very variable interval. In these observations *not* a characteristic response to the vibrating fork in any position. It is more so in smaller species, and is seen in exceptional individuals among the present. Among them, it is more usual in response to a relatively massive stimulus.

Folding: The spider immobilizes, with legs folded against body, the miscalled "death-feint." In Epeiras associated with dropping; not a normal response to present fork stimulation; as here seen, rather a product of other, and more massive accidental stimulus.

Shifting: The spider being at rest, moves the feet somewhat, but does not change its station. A response apparently arising when the fork, however presented, does not make on the receptors enough impression to set up any of the more differentiated responses noted below (cf. Schaxel, cited by Grünbaum, p. 287). Most strikingly seen in colonies of *E. cavatica;* a vibrating fork touched to a strand often elicited shifting through the colony generally, a few of the nearest making actual start for it.

Approaching: The spider resting at orb-center or in retreat, moves as to attack the fork held in contact with orb. Normal for all present species when resting at orb-center (Details on *E. diademata,* Peters, '31, p. 735). Less positive in long-matured (senescent?) individuals. For spiders in retreat (Boys; Barrows, p. 318): First movement (to center) frequent for *E. cavatica,* occasional for *E. trifolium, E. domiciliorum* (probable individual difference); less frequent for *E. insularis,* though on occurrence, relatively violent.

Shaking and/or Arching: The spider, resting at orb-center, arches legs, moving abdomen away from web; shakes web, sometimes for a whole minute, (function, cf. Barrows, p. 320; for *E. diademata,* Grünbaum, pp. 295, 297). Seen here most in early adult *A. aurantia* to fork held near venter, with orb between. Young *A. trifasciata* normally tilted the abdomen away from the fork, held to venter or dorsum.

Shuttling: The spider, resting at orb-center, moves

through the web and assumes a corresponding position on the opposite side. Seen almost exclusively in *A. aurantia,* in response to fork presented to the dorsum, no web intervening. Young individuals accomplished it nimbly, the older slowly and clumsily; in mid-season it was little observed. Individual (occasional?) differences marked.

Spreading: The spider resting at orb-center, or elsewhere in the web, extends one or more pairs of legs, and holds them in extended position; in response to a vibrating fork near the body, but not in contact with the web. Seen most developed in *E. insularis,* less in *E. trifolium* and *A. aurantia, E. domiciliorum, E. cavatica.* In extreme cases (Epeira) all legs except one or two by which spider hangs, bend in opisthotonic spasm away from fork held to venter between them. If fork is held to dorsum, legs may similarly bend back towards fork. More noticed is orientation of venter towards fork (Peckham, p. 391, for E. diadematа, Grünbaum pp. 292, 295), even through 180°, preserving tonic extension of legs. In *aurantia,* spreading did not generally involve more than the first two pairs and did not occur if the orb was between; in trifasciata it was little seen. Occasionally, spreading was observed (in *E. trifolium* and *cavatica* only) when fork was presented to venter of spider on back, folded in tonic immobility (Peckham, pp. 390-392).

Reaching: Flexor movements alternating with extensor, to stimulus as in "spreading". Seen most in *A. trifasciata,* marked also in *E. domiciliorum, E. stellata,* and *A. aurantia.* These were relatively free, waving movements; in *E. insularis* they were often rapid twitches, through a smaller arc. Fork is not grasped in these movements though within easy reach, and often touched (Peckham, p. 391).

Seizing: The reaching movements are more effective, clinging to the fork, there is swathing and attempt to bite; on withdrawal of fork, spider remains with it, sometimes to complete detachment from web. Seen in larger, maturer orb-weavers generally, but marked occasional (individual?) differences. Besides this seizure of approximated fork not in contact with web (if web is between, spider climbs through), fork normally seized when vibrated in contact with web (details for *E. diadematа,* Peters '31, pp. 721 ff.,

Peters '33, also Grünbaum, p. 292), if sufficiently vibrating when spider reached it. Seizing movements normally ceased as vibration of fork subsided; might or might not be renewed upon reactivation of fork (cf. Peters as above; also Rabaud pp. 37, 41).

The above tuning-fork responses are much modified and decreased when the spider has a support other than the web (not especially in Grünbaum's observations, p. 296), or when the spider is not at rest. In the individuals compared (mostly *cavatica, aurantia* and Uloborus) there was little difference in the responses observed to a comparison fork of designated 256 rate (cf. Barrows, p. 321; Peckham, p. 391; Grünbaum, p. 295). To the much greater volume of sound from a dry-cell operated telegraph buzzer similarly presented, practically all individuals observed were inert (Peckham, p. 390, contrary to Savory, pp. 90-91; cf. also Peters, '31, p. 705).

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ASILIDS FEEDING ON BUMBLEBEES IN NEW ENGLAND

By Stanley W. Bromley

In Dr. O. E. Plath's excellent book on Bumblebees ("Bumblebees and Their Ways", Macmillan Company, New York City, 1934) he records two instances (p. 62) of bumblebees captured by Robber flies. In both cases the large bumblebee-like *Bombomima* (*Dasyllis*) *grossa* (Fabr.) was the captor. As I have collected a number of records of Robber flies preying on bumblebees, it might be of interest to present a summary of these records. Five different species of Asilids were observed to kill bumblebees in New England with a total of 76 bumblebees[1] recorded as prey. The dates of capture range from 1910 to 1922 and were confined to Southern New England, most of them from Massachusetts.

Asilid	Bumblebee Prey Records
Proctacanthus philadelphicus Macq.	30
Diogmites (Deromyia) umbrinus Loew	29
Proctacanthus rufus Williston	10
Promachus fitchii Osten Sacken	6
Bombomima (Dasyllis) grossa (Fabr.)	1

On page 63, Dr. Plath states that he has never seen the near relative of *B. grossa*, *B. thoracica* (Fabr.), attack bumblebees, although he believes it probable that this species may do so. *Thoracica* is in general much more common in Southern New England than *grossa*, but I have never seen it feeding on bumblebees either, although I have on several occasions seen *thoracica* strike bumblebees in flight and unsuccessfully grapple them, indicating that the spirit at least is willing.

[1]The bumblebees herein referred to as prey of Asilids in New England were all workers and males of the following species listed in order of frequency: *Bombus vagans* F. Sm., *B. impatiens* Cress., *B. perplexus* Cress., *B. affinis* Cress., *B. fervidus* (Fab.), *B. terricola* Kby., and *B. bimaculatus* Cress. Some of these were recorded in my papers on Asilid Prey, Psyche XXI, No. 6, pp. 192-198 (1914) and Psyche XXX, No. 2, pp. 41-45 (1923).

AN AMERICAN SPECIES OF SOLENOPSIA

By Charles T. Brues

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The genus Solenopsia was first described by Wasmann in 1899 to include a very peculiar subapterous species of Diapriidæ from Europe. This extremely minute insect, found in nests of the thief ant, *Solenopsis fugax,* in Holland, France, and Italy is exceedingly ant-like in form, even to the development of a scale-like node on the dorsal face of the abdominal petiole. Of this species Wasmann knew only the female, but the male of a second species, *S. castanea,* has been since described by Kieffer from the Pyrenees in Southern France where it lives in nests of *Solenopsis geminata.*[1] Like the female, the male is practically wingless, but the antennæ are not so strongly clavate.

Solenopsia differs from all other Diapriidæ in the form of the abdominal petiole which is developed into an elevated node like that found only in certain ants, although it resembles that of a formicine or dolichoderine rather than that of a myrmicine ant, and the host with which it has been found in Europe is one of the Myrmicinæ.

Last summer I received from Professor C. H. Kennedy of Ohio State University several very beautifully executed pencil sketches of a minute strange hymenopterous insect that had been found in a nest of *Prenolepis parvula* in eastern Tennessee by Professor Clyde Dennis of Tusculum College. These sketches indicated that it was either a diapriid like Solenopsia or perhaps an aberrant embolemid.

At Professor Kennedy's suggestion I have since examined the specimen and it proves without question to be a species of Solenopsia, the first to be discovered in the New World.

It is closely similar to the European forms but the resemblance between the abdominal petiole and that of its host is

[1]Wasmann cites it as a guest of this ant, although Kieffer gives *S. fugax* as the host ant.

much closer than that of the Old World species to their myrmicine hosts.

The new species is described below, illustrated by several figures drawn by Mrs. A. S. O'Connor. The latter are to a great extent based on Dr. Kennedy's very excellent sketches which he placed at our disposal.

Solenopsia Wasmann.

Zoologica, Heft 26, p. 171 (1899).

Solenopsia americana sp. nov. (Fig. 1)

♀. Length 1.3 mm. Black; the thorax and abdominal petiole light reddish brown; the abdomen stained with brown below on the sides basally and pale at extreme tip; legs and antennæ more yellowish than the thorax. Head smooth and shining; the eyes small, rounded, placed well forward on the sides of the head at about the middle; ocelli small, in a small equilateral triangle. Antennæ 11-jointed, inserted above a very narrow shelf at the level of the eyes; scape long, nearly as long as the head, curved and much thicker toward apex; pedicel longer than wide, about one-fourth as long as the scape; first flagellar joint much narrower than the pedicel, especially at the base; following six joints gradually wider and of about equal length, each shorter than the pedicel; last three joints forming a large, abrupt club, the basal joint narrowed at base, the second widest and the third longest. Seen in profile the head is evenly arcuate above and the long, sharply receding face forms a straight line above, curving inward toward the mouth; mandibles small, more or less triangular and apparently pointed at apex. Pronotum short at the median line, but extending back to the tegulæ as a broad lateral band on each side of the mesonotum; scutellum separated by a very fine transverse basal suture, its posterior narrowed portion convex, with the basal impression single, with each side bent posteriorly in the form of a broad, inverted crescent; propodeum much narrowed above with the apex sharply widened and concave behind to form two backwardly directed arms which encircle the sides of the abdominal petiole when the latter is turned upwards, these arms more or less acute apically. Upper surface of abdominal petiole

steeply sloping forwards, about twice as long as wide, the petiole much broader below; the sides moderately woolly. Second segment occupying nearly two-thirds the length of the abdomen; following tergites short, slightly decreasing

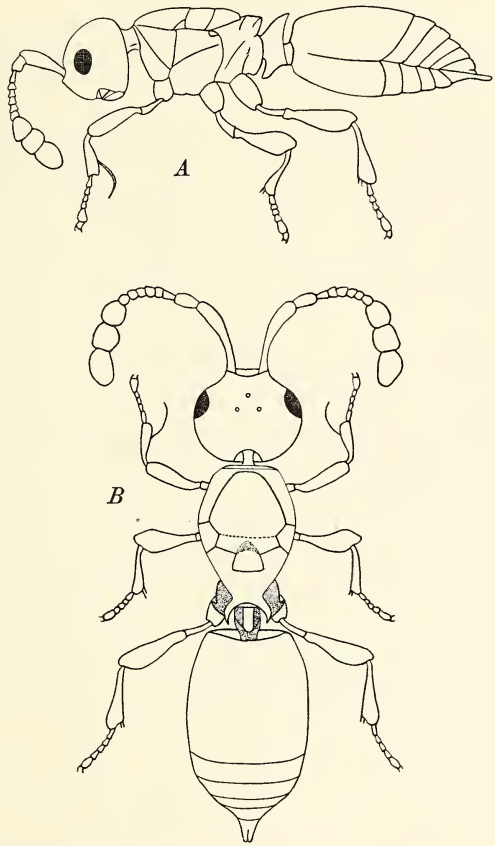


Fig. 1. *Solenopsia americana* sp. nov. *a*, lateral view; *b*, dorsal view.

in length apically. Ovipositor short, with two short, rather broad valves when seen from above. Legs moderately stout, the trochanters very long; all the femora and tibiæ clavate, the front tibia with a very long, curved spur arising well be-

fore the apex. Wings preserved as vestiges; neither fore wing present in the type, but one very small hind wing remains attached as an oval, apparently complete wing with a costal vein-like thickening, this wing reaching about to the tip of the propodeum.

Type from Eastern Tennessee, collected in a nest of *Prenolepis parvula* Mayr, by Professor Clyde Dennis. The type is in the collection of the Ohio State University, Columbus, Ohio.

There is another genus in North America which is very similar to Solenopsia. This is Auxopædeutes first discovered by Professor W. M. Wheeler as a guest of *Solenopsis molesta* near Austin, Texas and described by the present writer in 1903.[2] Later, I found a second species in Eastern Massachusetts also in a nest of *Solenopsis molesta*.[3] Auxopædeutes differs from Solenopsia in having twelve joints in the antennæ and by the less modified petiolar segment of the abdomen. The latter is slightly raised dorsally, but does not rise scale-like as in Solenopsia and its rounded dorsal boss lies under and not between the propodeal processes. In both species of Auxopædeutes the wings are completely absent and not represented by vestiges.

Still another genus, Trimicrops Kieffer should be compared with Solenopsia. Kieffer placed this in the Calliceratidæ[4] although it differs from all members of that family in the form of the head and insertion of the antennæ on a shelf far above the clypeus as in the Diapriidæ. I have never seen specimens of Trimicrops, but suspect very strongly that it also is a diapriid, quite similar to the genera discussed above.

[2]Trans. American Entom. Soc., vol. 29, p. 126.

[3]Bull. Wisconsin Nat. Hist. Soc., vol. 8, p. 82 (1910).

[4]Ann. Soc. Sci. Bruxelles, vol. 30, p. 16 (1906) and also Das Tierreich, Lief, 42, p. 127 (1914).

AN ODD HIBERNACULUM

By H. Elliott McClure

It is well known that birds' nests, mice nests, loose bark, and other hiding places serve as hibernacula for numerous insects, but the winter inhabitants of a bald faced hornet's nest, *Vespa maculata* Kirby, were surprising.

On March 4, 1933 in the Brownsfield woods, an oak-maple woods near Urbana, Illinois, a large *Vespa* nest, forty feet above the ground, was discovered on a limb of a sugar maple tree. It was secured and removed to the laboratory for examination. At the time it was taken the temperature was 2° C.

The nest was 32 centimeters wide and 45 centimeters long with 13 layers of paper on the outside and six tiers of cells. It weighed 407 grams. The opening was not at the bottom, but several centimeters up on the side. Below this hole in the bottom of the nest was a sort of graveyard. 100 dead adults were massed there and of these the sex of 52 was identifiable. They were all males. Of the 2720 cells in the six tiers 165 were still capped and contained pupae or adults and there were 30 dried and shriveled larvae in uncapped cells.

Soon after the hive was brought into the warm laboratory a rustling was noted thruout it. Upon tearing it apart 65 cockroach nymphs, *Ischnoptera pennsylvanica* (De Geer), were captured. They were hiding in between the layers of paper. Besides these, three spiders (*Philodromus pernix*), two spiders (Drassus, immature) and six undetermined mites were found. Thus there were 76 arthropods hibernating in these quarters. Probably the roaches came to the nest for the food available and may have been there before the winter set in. The spiders probably moved in with the advent of cold weather. The rôle played by the mites was not determined.

TWO RECENTLY INTRODUCED SPECIES OF AMARA (COLEOPTERA: CARABIDAE)

By P. J. Darlington, Jr.

Museum of Comparative Zoölogy

During recent years the following two species of Amara have been common in the Boston region, even on the streets of the suburbs. They are not, however, represented in the collection of the former Boston coleopterist Roland Hayward, whose revision of Amara was completed about 1906. This makes it practically certain that the species have been introduced since that time. Both are common European species. My identifications have been confirmed through the kindness of Mr. Arnošt Jedlička of Prague. Mr. L. L. Buchanan, after a comparison of specimens with the Casey Collection, has determined the synonymy cited.

Amara (*s. s.*) *aenea* (Deg.) (*devincta* Csy.): I have seen this species not only from Boston but from Walton, New York, G. W. Herrick collector (U. S. N. M.). The type of Casey's *devincta* (Memoirs 8, 1918, 307) was from New London, Connecticut. *A. aenea* is similar to our western American *cœlebs* Hayw., to which it runs in Hayward's key (Trans. American Ent. Soc. 34, 1908, pp. 49-50). In fact *cœlebs* differs from *aenea* (known from Europe and Siberia), so far as I can see, only in its (*cœlebs*) somewhat broader and less convex form.

Amara (*s. s.*) *familiaris* (Duft.) (*humilis* Csy.): Casey's specimens (*l. c.*, 302) were from Rhode Island and Long Island. The species is common in eastern Massachusetts (Boston, Nahant, Ipswich) and in New Hampshire (Exeter, Rumney, Mt. Washington, Connecticut Lake). It differs from all our native Amara (*s. s.*) in its small size (6 mm., more or less) and pale legs. It resembles some of the species of subgenus Celia, but the hind tibiae of the ♂ are distinctly, although not conspicuously, pubescent within near the apex.

NEW AND LITTLE KNOWN SPECIES OF TEGENARIA
(Araneida: Agelenidae)

By Harriet Exline

University of Washington

Three new species of Tegenaria have been found in the Pacific Northwest and are described in this paper. Two other species, *Tegenaria nana* Simon and *Tegenaria californica* Banks, are included because they are quite common in the Northwest, and because their original descriptions included no figures. The most common Tegenaria represented in this locality is the cosmopolitan species *Tegenaria derhami* (Scop.), a description of which is omitted because it is adequately described and figured elsewhere (Emerton: Common Spiders, 1902, p. 96; ibid: New Eng. Spiders, Trans. Conn. Acad., Vol. VIII, 1889, p. 29, f. 6.).

Notes of appreciation are expressed to Miss Elizabeth B. Bryant of the Museum of Comparative Zoölogy for identifying specimens of Tegenaria, and to Drs. Melville H. Hatch and Robert C. Miller of the University of Washington for their help and inspiration, and especially to Professor Trevor Kincaid for the loan of his collection of spiders.

Tegenaria gigantea Chamberlin and Ivie (Fig. 3)

Tegenaria gigantea Chamberlin and Ivie, 1935, Bull. Univ. Utah, vol. 26, p. 31, pl. XIII, f. 106.

Male: Length 15 mm., with extremely long, slender and hairy legs. Cephalothorax reddish yellow, becoming quite reddish on cephalic part and almost black around and in front of the eyes. The cephalic part is rounded, highest in the center, the sides are almost parallel, and the entire cephalic region is raised and sharply separated from the thoracic part which is rather flat and almost circular in outline. The chelicerae and mouthparts are almost black, somewhat geniculate, with prominent yellow condyles. The eyes

are about equal in size, although the posterior eyes are not quite so large as the anterior eyes, the posterior eyes in a slightly procurved row, well and equally separated; anterior eyes in an almost straight row (from a dorsal view) and closer together. Anterior median eyes the radius of one of them apart, and not quite so far from the anterior lateral eyes. Legs tannish yellow except femora of first pair which are brown; the first leg measures 4.5 cm. The abdomen is slender, and yellow with many dark gray markings; the area in the anterior median region is unmarked. The hind spinnerets are long, with the apical segments a little longer than the basal segment. The palpus is slender with the cymbium well clothed with long hairs. The tibia of the palpus is slightly swollen distally and has two large tooth-shaped apophyses extending latero-anteriorly on the lateral side. The embolus of the bulb is slender and arises from the inner distal margin, curving laterally to end in a projecting conductor in the lateral posterior region.

Male, collected at Nanaimo, B. C. by Professor Kincaid, Sept. 8, 1934. (Exline Coll.)

This species nearest *Tegenaria derhami* Scop. from which it is separated by its much greater length and by the structure of the bulb of the palpus.

Tegenaria quadrata n. sp. (Fig. 4)

FEMALE: Length 5.6 mm. Cephalothorax brownish yellow with a few irregular gray marks including a narrow marginal line, and a row of spots between this and the median furrow opposite the legs, and a large median gray area. Chelicerae and legs same color as the cephalothorax, legs banded with gray. Eyes large and quite widely separated; posterior eyes in a straight row equally spaced and equal in size; anterior median eyes smaller than other eyes separated by a distance once and a half as great as their diameter, nearer the anterior lateral eyes; thus the rectangle formed by the median eyes is large and perfect, longer than wide. Abdomen globose with a gray-white background and many darker gray markings. The apical segment of the hind spinnerets is a little shorter than the basal segment. The area of the epigynum is raised and heavily

chitinized; on the anterior margin is a small depression which obviously bears pores leading into the spermathecal ducts; these ducts are indistinctly seen through the chitin extending from the depression almost to the genital furrow in the midline. The spermathecae can be indistinctly seen in the anterior lateral parts of the epigynum.

HOLOTYPE: Female, collected at Seattle, Wash., by Professor Kincaid. (Exline Coll.)

Closest to *Tegenaria californica* Banks, but separated by the much greater distance between the anterior median eyes, and the large chitinized area of the epigynum which is negligible in *T. californica.*

Tegenaria magnacava n. sp. (Fig. 5)

FEMALE: Length 11 mm. Cephalothorax light reddish yellow with grayish streaks on the sides, cephalic part only a little darker than the thoracic; cephalothorax moderately rounded with no great demarcation between cephalic part and thoracic. Chelicerae quite geniculate in front, red in color. Legs well clothed with hair, moderately long and tannish or reddish yellow. Eyes of equal size, those of posterior row somewhat procurved, widely and equally spaced. Eyes of anterior row almost equally spaced, but slightly nearer each other than those of posterior row. Abdomen with a light yellowish gray background and mottled and checked with dark gray markings. Epigynum large surrounded by a thick posterior fold of chitin and an anterior semicircular fold; the cavity formed by these is large and deep. See fig.

HOLOTYPE: Female, collected at Seattle, Wash., Nov. 20, 1930. (Exline Coll.)

Similar in size and physical structure to *Tegenaria derhami* Scop. The epigynum is entirely different in form from that of any other species, consisting of a large cavity surrounded by chitinous folds.

Tegenaria nana Simon (Fig. 1)

Tegenaria nana Simon 1897, Annal. Soc. Entom. Belgique, Vol. XLI, p. 17.

FEMALE: Length, 4.0-5.5 mm. Cephalothorax tannish

yellow with three indefinite gray spots on each side of the thorax, a marginal gray band and a few gray lines on the head part; cephalothorax rather roundly arched. Chelicerae not at all geniculate. Eyes large in proportion to size of spider; posterior eyes in nearly straight row, almost equally distant (less than a diameter of one of the eyes) and equal in size; eyes of anterior row very close together and median eyes considerably smaller than the lateral eyes. Legs yellow in some specimens, orange or tan ringed with gray in other specimens. Abdomen globose, pale grayish yellow with many dark gray markings especially in the posterior half; these markings form a row of double concave arches down the center of the back posteriorly. Apical segment of hind spinnerets is slightly shorter than the basal segment. The epigynum is raised, rounded off imperceptibly into the venter; in its center is a heart-shaped dark reddish brown chitinized area, which shows two slight impressions; these are the openings to the ducts leading to the spermathecae; posterior to this area is a slender median dark band running to the epigastric furrow; this dark band is caused by the ducts which lead into the spermathecae, which in a few specimens are slightly visible as round balls underneath the chitin.

MALE: Length, 4.0-4.5 mm. Cephalothorax very evenly rounded with cephalic grooves very shallow, yellow in color with very slight gray markings. Chelicerae, and relationships between the eyes as in female; legs about the same except that they are more solidly one color, yellow, or orange brown. Abdomen slender, white background with dark gray markings numerous in the posterior part, very much as in the female. Hind spinnerets with apical segment a little shorter than basal segment. Tibia of male palpus with two basal teeth, black in color on the lateral margins, then a deep horizontal groove which ends in the middle of the segment with a rather large black, flat projection directed anteriorly; on the distal margin of the tibia it bears another lateral projection pointing anteriorly. The cymbium of the palpus is deeply rounded in its body part but anteriorly slenderizes suddenly and has a narrow, short tip.

HYPOTYPES: Male specimens, collected March 24, 1932, and Oct. 1, 1932, Olympia, Washington (Exline Coll.).

Female specimens from Seattle, Olympia, and Beaver Creek, Oregon.

Tegenaria californica Banks (Fig. 2)

Tegenaria californica Banks[1] 1896 Journ. Ent. News, Vol. 4, p. 90.

FEMALE: Length 7-9 mm. Cephalothorax orange marked with black lines and spots; legs long, hairy, ringed with dark gray. Posterior eyes in straight row, almost equidistant, laterals slightly larger than the medians; anterior eyes with medians smaller than laterals and further apart than from laterals. Abdomen large, globose, gray with light spots; posterior spinnerets with hind segment slightly shorter than basal segment. The area of the epigynum is decidedly convex, with a small shallow atrium in the center, in which two very small spots mark the opening of the spermathecal duct; the spermathecae show slightly through the chitin in the anterior lateral margins; a dark ridge of chitin extends posteriorly from the center of the posterior margin of the atrium to the epigastric furrow.

MALE: Length 5-6.5 mm. Eyes all equal in size, eyes of posterior row and anterior row all equidistant. Tibia of palpus with a basal, almost horizontal, apophysis and a distal pointed apophysis on the lateral margin; embolus almost encircling bulb.

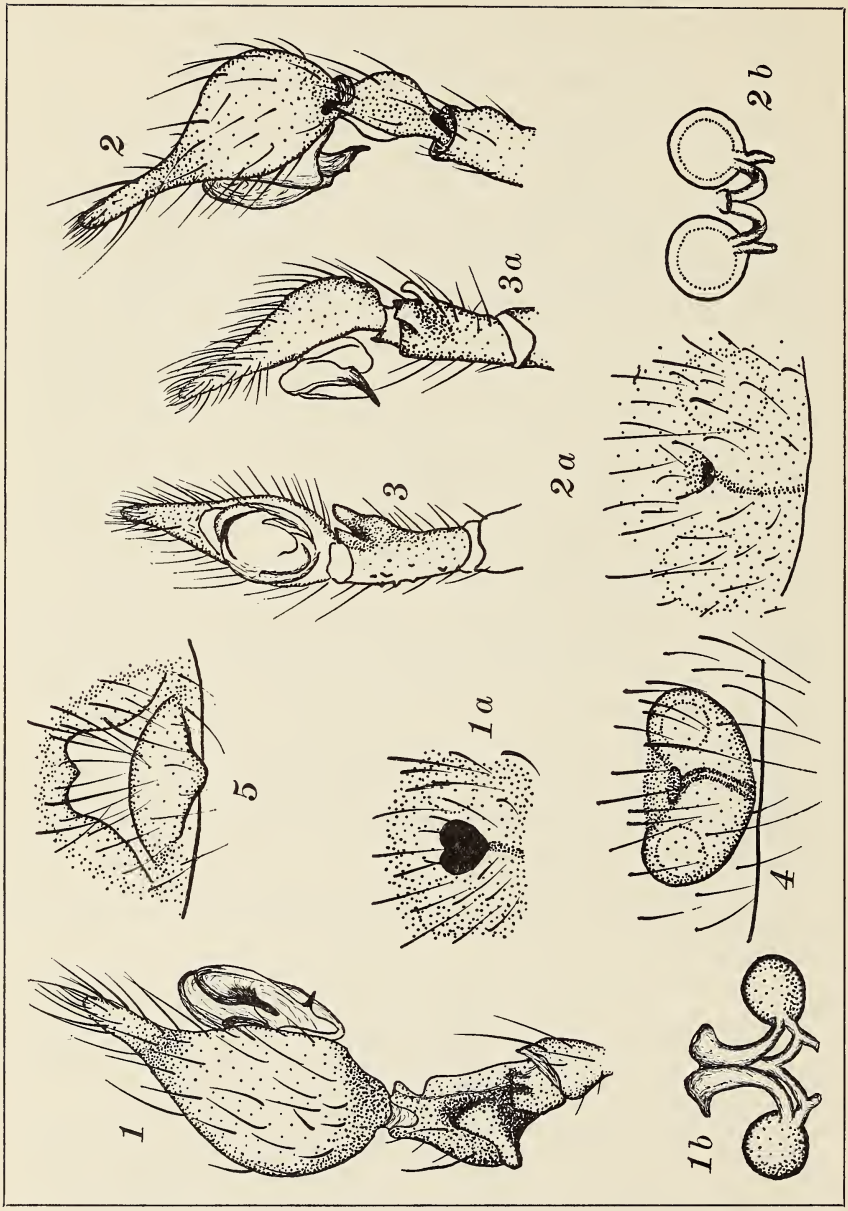
Distribution in Washington: Western part of state. Specimens from Stillaquamish River (Snohomish Co.); Lebar, Olympia Mts.; Fort Canby (Pacific Co.); Everett; Seattle; and Olympia (in Exline Coll.).

[1]Identifications of this and above species kindly made by Miss Elizabeth B. Bryant of the Museum of Comparative Zoölogy, Harvard University.

EXPLANATION OF PLATE 1.

Figure 1, 1a, 1b. *Tegenaria nana* Simon. (1, palpus of male, × 29; 1a, epigynum of female; 1b, epigynum of female dissected out from a NaOH solution) × 63.
Figure 2, 2a, 2b. *Tegenaria californica* Banks. (As above.)
Figure 3, 3a. *Tegenaria gigantea* Chamberlin and Ivie. (3, ventral view of palpus; 3a, lateral view of palpus) × 13.
Figure 4. *Tegenaria quadrata* n. sp. (Epigynum of female) × 63.
Figure 5. *Tegenaria magnacava* n. sp. (Epigynum of female) × 63.

Psyche, 1936 Vol. 43, Plate I.



Exline — Species of Tegenaria.

BOOK REVIEW.

Our Enemy the Termite, By Thomas Elliot Snyder.

Comstock Publishing Company, Ithaca, New York, pp. xii 196, 57 illustrations.

In this book Dr. Snyder, senior entomologist of the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture and one of the earliest members of our increasing band of termitologists, has given us a succinct and authoritative account, with abundant illustrations, of the caste system, feeding and nesting behavior, guests, parasites and fossil record of termites in general and of the more important of the nearly 60 North American species in particular, with detailed suggestions concerning the best methods, based on much observation and experimentation by the Department of Agriculture, of controlling their depredations. Owing to its brevity the account will probably find many readers who lack the time or inclination to peruse the larger volumes of Hegh and of the California students of termites ("Termites and Termite Control by Kofoid, Light and Others, 2nd edit. University of California Press). Dr. Snyder maintains with Imms and some other authors that the termite castes have a genetic and not a trophic origin, and agrees with Emerson that the worker caste is phylogenetically derived from the soldier. The student of other social insects will not fail to find in the first and second chapters of the book many interesting statements such as the one on page 5, that "termite queens in artificial colonies are known to have lived for twenty-five years," which is longer than the longest record (17 years) for ant queens, and the statement that termite eggs secrete exudates, one that may also be true of ant eggs, though not hitherto advanced by myrmecologists. Several of the illustrations are very striking, such as those of the similar egg-masses of the subsocial cockroach, *Cryptocercus punctulatus* and the most

primitive of living termites, *Mastotermes darwiniensis*, the figure of *Cryptotermes brevis*, with its phragmotic head, so like that of the ants of the subgenus Colobopsis, and the figures illustrating the great damage by termites to woodwork, books, clothing, shoes, firearms, etc. The systematist will be interested to learn that: "It may eventually be proven that new species of *Reticulitermes* are being evolved, i.e., there are now 'nascent' species, or species in the making. Certain species are very close morphologically, and races or sub-species exist with composite characters; close species may be merely variations! Or, since termites are plastic, or easily moulded, it may be that there is a tendency toward a mean, and in reality there are no sub-species."

As would be expected from so competent an entomologist, there are few errors in the book and these are unimportant. The term "zorapterids" (p. 19) is not correctly rendered by "wingless forms of life", if the author really supposed the first syllable to be derived from *zoe*, nor are the jaws of *Capritermes* "goat-like"; the species of Megachile and Euglossa (p. 98) are not "large wasps," but bees, and the authority for *Amitermes wheeleri* (p. 175) is not "Dean," but Desneux. The arrangement of the text might have been considerably improved in places and the style, though usually clear, seems lacking in vitality, especially in the last chapter, which deals with matters in which it is difficult to sustain a general reader's interest.

Cambridge, Massachusetts. W. M. Wheeler.
January 29, 1936.

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TRICHOPTERA FROM THE FIJI ISLANDS

By Nathan Banks

From the Fiji Islands Brauer in 1867 described three species of caddice flies, *Wormaldia nervosa, Hydromanicus ruficeps,* and *Hydromanicus piceus.* In 1924 I added three more from material collected by W. M. Mann in 1915, *Goera fijiana, Chimarrha manni,* and *Chimarrha obscurella.* In 1934 Mosely described two more, *Trianodes dubia* and *Hydropsychodes fijiana;* he also places the two Hydromanicus of Brauer in the genus Hydropsychodes.

From additional material collected by Mr. Mann (part of which was alcoholic) I am adding seven more, making a total of fifteen species, placed in nine genera and four families.

SERICOSTOMATIDÆ

Gœra fijiana Bks.

Besides the type there are specimens from Wainganitu and Mt. Victoria, Viti Levu.

CALAMOCERATIDÆ

Anisocentropus fijianus sp. nov.

Yellowish, antennæ, palpi, and legs pale yellowish, darker on vertex and thoracic notum; fore wings yellowish, with fine short black hairs, but otherwise rubbed; stigmal area opaque whitish, from behind this is a curved brownish band with irregular edges, extending to hind margin crossing the middle of the discal and the apical half of the median cell, in certain lights it shows a purplish sheen; hind wings nearly hyaline, with gray hair and fringe.

Fore wings short and broad, nearly as broad as *A. flavicaput,* discal cell only about two-thirds of its pedicel and

hardly longer than second apical cell, fork one back on discal cell hardly width of cell, fork two back on discal cell a little, fork three back on median cell a little, fork four also back on median cell hardly width of cell. Venation of hind wing much like *A. flavicaput,* except that the cross-vein from medius to fork five is not oblique.

Male genitalia largely covered from above by a broad membraneous plate with emarginate sides, through the emargination projects a slender clavate bristly appendage, there is a slender pointed median piece above this plate. From side is seen a moderately slender lateral appendage, very hairy, especially below; a smooth median piece (also seen from above) projects below the tip of lateral appendage, two slender hairy ventral pieces.

Fore wing 7 mm. long.

From Wainunu, Fiji Islands (W. M. Mann). Type M.C.Z. No. 22041.

LEPTOCERIDÆ

Notanatolica pallida sp. nov.

Yellowish, vertex and thoracic notum more brown; antennæ pale, with narrow brown annulations; palpi yellowish, with gray hair; legs pale yellowish, front tarsi more brown. Fore wings pale, stigmal area rather dark and back across the anastomosis, two brown streaks at base, one costal, the other between anal veins; hind wings pale and with yellowish veins.

In fore wings the discal cell is hardly one half as long as its pedicel; fork one equals discal cell and has a pedicel two thirds its length, fork three does not quite reach to the cross-vein; the cross-vein from sector to radius is about its length before end of discal cell, the cross-vein from sector to medius also about its length before end of discal cell, cross-vein from medius to cubital fork a little beyond it; hind wings with no fork one; cross-vein from sector to medius about twice its length before end of discal cell, fork three reaches back about opposite end of discal cell, pedicel one third its length.

Male genitalia show above a triangular plate at base, a pair of bristly appendages with sub-parallel sides, and

below there is a smooth piece with bilobed tip; the lateral appendages are rather broad on basal part, smooth, and with a few long bristles toward tip and below, the apical part more slender and hairy, beneath it projects the hooked tip of a spur from the inner basal part.

Fore wing 13 mm. long.

From Wainganitu, Fiji Islands (W. M. Mann). Type M.C.Z. No. 22042.

Triænodes dubia Mosely

A rubbed female, 7 mm. long fore wing, agrees very well with the figure of venation; a short fork one, long discal cell, irregular elongate hyaline white mark over much of the anastomosis. From Wainganitu, Fiji.

Triænodes manni sp. nov.

Yellowish, abdomen slightly brownish, antennæ with narrow ring of brown at apex of each joint. Fore wings yellowish, darker over stigmal region and back broadly over anastomosis, the anastomosis itself being mostly white, some dark along veins toward base of wing, a dark spot at base of fork one and on other veins behind this, and beyond a more or less definite dark band across wing, a larger spot near end of cubitus; in female much of the apical area is brownish, and also most of the basal half of wing, the anastomosis, however, remains white.

In fore wing fork one is much longer than the pedicel, the discoidal cell longer than its pedicel, third apical vein ends a little before tip of wing, no trace of stub to fifth apical vein, but in the field behind the discoidal cell there is a short longitudinal faint line or vein, possibly a remnant of the medius. The genitalia are much on the plan of *T. bœttcheri* Ulmer from the Philippines; the slender superior median piece with the longer slender lateral pieces (both more elongate than in *T. bœttcheri*), the long slender spine-like processes reaching beyond the lower appendages, and with a slightly out-curved tip; the long median piece is curved down over the end of the lower appendages, and from side as well as above the tip is broad and rounded (pointed

in *T. bœttcheri*) ; the lower appendages are long, with blunt, broad tips (narrowed in *T. bœttcheri*) and from below each is seen to be bilobed at tip, each has above (as in *T. bœttcheri*) a slender curved process from the base.

Length of fore wing 6.5 mm.

From Wainganitu, Fiji Islands (W. M. Mann).

Type M.C.Z. No. 22043.

Œcetinella pulchella sp. nov.

Pale yellowish, vertex and a broad median stripe on thoracic notum brown; antennæ, palpi, and legs pale. Fore wings tinted with brown on most of the apical half, and behind; in basal part with a broad brown band with irregular edges across over the bases of median and discal cells, and an elongate brown spot before this between the radial sector and the medius; stigmal region opaque, whitish, with a brown mark near base, and another near tip; these tend to form bands since the veins behind them are more darkly bordered than the general surface; each apical vein has a dark brown mark at tip, and also at end of anal veins; in some places there are hyaline spots in the brown, mostly along veins in the basal part; hind wings hyaline. The venation is extremely similar to *Œ. confluens*, except that the cross-vein from fork of radial sector to fork of the medius is beyond the end of discal cell (before in *confluens*), the discal cell is longer than in *confluens,* extending back almost as far as median cell (much shorter than median cell in *confluens*), fork one extends a little further back on discal cell, and the end of the median cell is more oblique than in *confluens.*

The male genitalia show above three slender, hairy pieces, the lateral ones the broader, and just below is a long-forked smooth process. From the side the lower appendages of the only male are not the same; on right side is a long curved piece, rather broad throughout, but entire at tip, on the left side is a piece which is broadened and forked at tip, the upper fork long, slender and curving upward.

Fore wings 5 mm. long.

From Wainganitu, Fiji Islands (W. M. Mann).

Type M.C.Z. No. 22044.

HYDROPSYCHIDÆ

Hydropsychodes fijiana Mosely

Many specimens from Wainganitu, Fiji Islands (W. M. Mann).

Hydropsychodes ruficeps Brauer

Three females from Wainganitu, Fiji (W. M. Mann). In this species the subapical spot is further from the outer margin than in *H. fijiana,* and the submedian spot occupies most of the discal cell (in *H. fijiana* just before this cell); the cross-vein from first anal vein to cubitus is more basally placed than in *fijiana* and is very oblique, and just before it is a small patch of white hair (not shown by Brauer). The dark band above antennæ is broader than indicated by Brauer; the fork two goes back on discal cell further than fork one, but hardly as far as in *H. fijiana;* in the maxillary palpi the joints two and three are about equal, and four plainly shorter.

Hydropsychodes piceus Brauer

One female from Wainganitu, Fiji Islands (W. M. Mann) agrees fairly well with Brauer's description; it is a little larger, fore wing nearly 7 mm. long; the discal cell is much smaller than in *H. fijiana,* and fork two is scarcely a bit further back on discal cell than fork one; the cross-vein from first anal vein to cubitus is much more basally placed than in *H. fijiana,* and is scarcely oblique, fork three is longer than in *fijiana* and very slender. In hind wings fork two goes back on discal cell two thirds the length of cell, and fork three is longer than in *fijiana;* the maxillary palpi have joints two, three, and four subequal in length, but four is more slender.

Polyplectropus manni sp. nov.

Head yellowish, vertex scarcely darker, the warts yellow; palpi and antennæ yellowish; pronotum yellowish, mesonotum brownish, rather darker on the sides; abdomen pale brown above, venter paler; legs yellowish, spurs scarcely darker. Fore wings pale yellowish brown, with a long dark

streak over stigmal area to the tip; hind wings rather gray, with scattered black hairs.

In the fore wing the discal cell is over three times as long as broad at tip, fork one shorter than its pedicel, fork two sessile on discal cell, fork three longer than its pedicel, fork four nearly back to end of median cell, fork five back to slightly before the end of anal veins; in hind wings fork one is very short, fork two back almost to cross-vein, fork five back to the cross-vein.

Male genitalia show a slender median superior piece, with a spine at each apical corner, the lateral appendages are broad at base, tapering, somewhat abruptly above near middle, and at tip with a slender, apparently flexible, sinuous part, this appendage is very bristly; the lower appendages are somewhat shorter, broad and heavy, with rounded tips, from below they are divergent; between is a short, slender penis with enlarged tip.

Fore wings ♂ 4.6 mm., ♀ 7 mm.

From Wainganitu, Fiji Islands (W. M. Mann). Type M.C.Z. No. 22045.

Polyplectropus fijianus sp. nov.

Head yellowish, vertex scarcely darker; palpi and antennæ pale yellowish, latter rather heavy; pronotum pale yellowish, mesonotum reddish brown, except lobes in front of the wings which are yellow; abdomen dark brown, genitalia pale; legs (including spurs) pale yellowish.

Fore wing yellowish brown, costal and especially the stigmal region much darker; hind wings nearly hyaline. In the fore wings the discal cell is nearly three times as long as broad at tip, fork one with moderately long pedicel, fork two back a little on discal cell, fork three with a long pedicel, fork four reaching only a little basally of fork three, fork five almost back to mediocubital cross-vein.

Genitalia with a slender superior median appendage, seen from side the tip upcurved; lateral appendages with a superior subbasal process and a sharp curved tip; inferior appendages long and thick, on the upper edge a little beyond middle is a long curved hook or tooth.

Fore wings ♂ 5 mm.

From Mt. Victoria, Viti Levu, Fiji Islands (W. M. Mann). Type M.C.Z. No. 22046.

Chimarrha signata sp. nov.

Head pale, a large triangular black spot between ocelli; palpi pale brown; antennæ dull yellowish; pronotum pale; mesonotum brown, except the yellow scutellum; legs dull yellowish, spurs brown.

Fore wings brown, uniform, except for a large hyaline-white spot in middle, over the discal and median cells and the space between them; hind wings brown in apical and costal parts, elsewhere nearly hyaline. Fore wings with discal cell hardly twice as long as broad, the radial sector just before it slightly curved, and the radius above the discal cell is also a little curved; forks one and two sessile on discal cell, fork three very much shorter than pedicel, fork five opposite base of discal cell. In hind wings fork one is extremely short, fork two back to discal cell, fork three also extremely short.

Male genitalia show the lower appendages swollen near middle on outer side, the apical part small, pointed, and very hairy; from above the lower appendages show a subbasal projection tipped by stiff bristles, between these processes are two long slender dark rods.

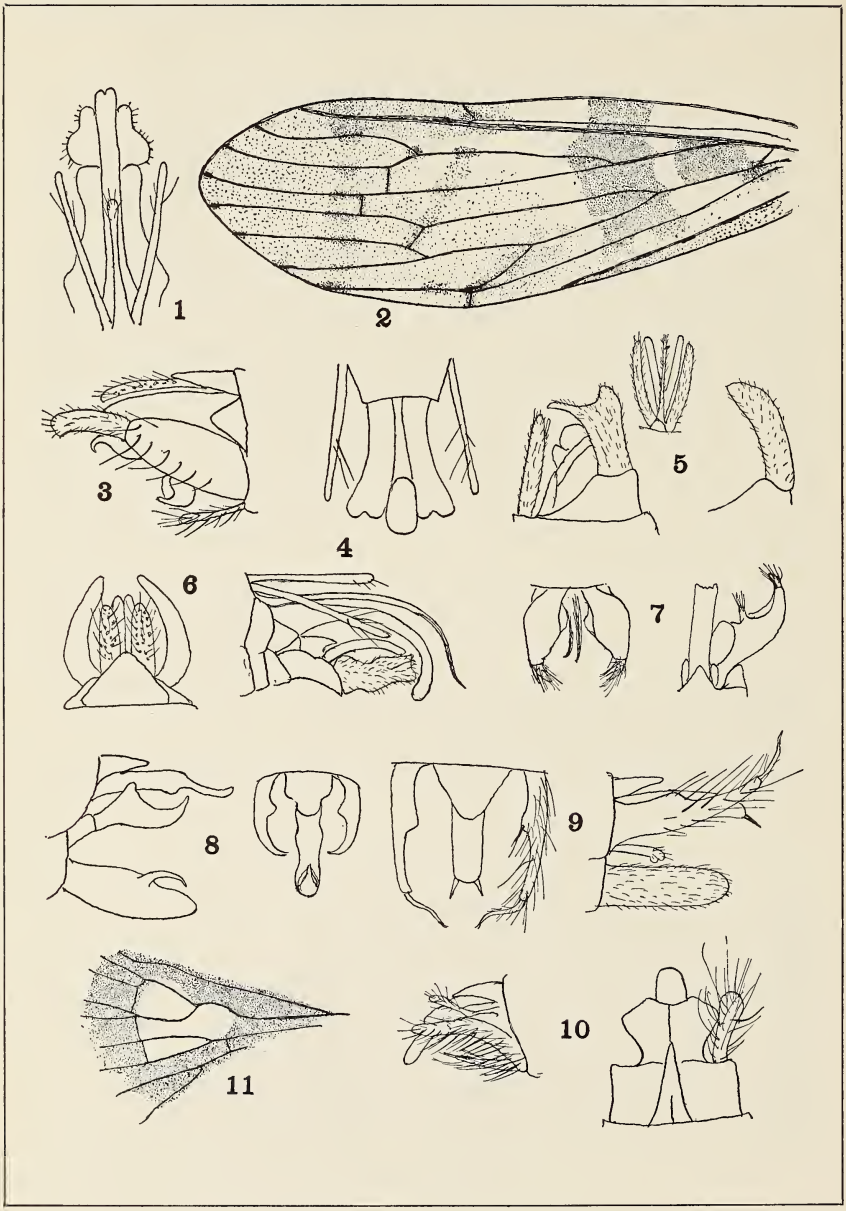
Fore wings 4.3 mm. long.

From Taviuni, Somo Somo, Fiji Islands (W. M. Mann). Type M.C.Z. No. 22047.

EXPLANATION OF PLATE 2

Fig. 1. *Triænodes manni*, genitalia, above.
Fig. 2. *Oecetinella pulchella*, forewing.
Fig. 3. *Notanotolica pallida*, genitalia, side.
Fig. 4. *Triænodes manni*, genitalia, side and below.
Fig. 5. *Oecetinella pulchella*, genitalia, side, above, and left clasper.
Fig. 6. *Notanotolica pallida*, genitalia, above.
Fig. 7. *Chimarrha signata*, genitalia, above and below.
Fig. 8. *Polyplectropus fijianus*, genitalia, side and above.
Fig. 9. *Polyplectropus manni*, genitalia, above and side.
Fig. 10. *Anisocentropus fijianus*, genitalia, side and above.
Fig. 11. *Chimarrha signata*, part of forewing.

Psyche, 1936 Vol. 43, Plate II.



Banks — Trichoptera from Fiji Islands.

THE TOXICITY OF TRIMETHYLAMINE FOR *NECROPHORUS ORBICOLLIS* (SAY).

By Cyril E. Abbott

Morgan Park, Ill.

As a natural decomposition product of flesh, trimethylamine [$N(CH_3)_3$], is found, in varying concentrations, in those animal remains to which various necrophilous beetles are attracted. It is of some interest to know, then, how well a species such as *Necrophorus orbicollis* can withstand the toxic effects of this chemical.

For testing the resistance of the beetle to various concentrations of the substance a glass jar with a hollow, ground-glass stopper was used. The jar had a capacity of 125 cc.; the hollow in the stopper 5 cc. The stopper was stuffed tightly with cotton, which was then soaked with all the solution it would contain without dripping. The jar was cleaned with hot water, the stopper replaced, and the whole allowed to stand for 1 minute before the specimen was introduced. The beetle was thus exposed to the chemical in its gaseous form.

The insects used were active adults, and, although but one specimen was used at a time, each experiment was repeated with two additional beetles, so that an average could be determined; this was necessary because individuals varied in size. The data on any specimen showing an unusually long or short period, as compared with the other two specimens, was discarded; the average then being taken from the two remaining.

It is somewhat difficult to determine the exact death-point for the Necrophori. Preliminary experiments indicated that although parts of the body may move for hours, beetles in which not more than one tarsus twitched spasmodically never recovered after removal from the jar; this was considered the "death-point," and the time elapsing

between the introduction of the insect into the jar and this point constituted the time necessary to produce death.

The stock solution of trimethylamine had a concentration of 33%. It is doubtful if a greater concentration than this ever occurs in nature. Dilutions of the stock solution with water were used for the remaining tests.

By making a few progressive records of the action of the chemical on the beetles, paralysis was found to occur in the following order:

1. Paralysis of posterior legs.
2. Paralysis of middle legs.
3. Paralysis of anterior legs. (This followed so closely upon that of the middle legs that in concentrated atmospheres the time interval could not be determined.)
4. Paralysis of antennæ.
5. Paralysis of mouth-parts (practically all at once).
6. Spasmodic twitching of tarsi and tip of abdomen.
7. Slow movements of legs and head.
8. Movement of abdomen only. (May continue for many hours.)
9. All movement ceases.

The time durations necessary to bring about death at various concentrations of trimethylamine were as follows:

33% — 5 minutes	10% — 22 minutes
25% — 7 minutes	5% — 40 minutes
20% — 10 minutes	1% — 70 minutes

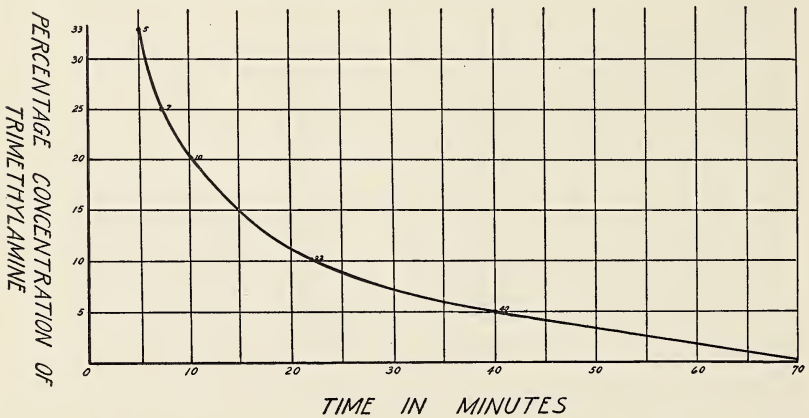


FIG. 1. Toxicity of trimethylamine for *Necrophorus orbicollis*.

The graph (Fig. 1) indicates a little more clearly the relation between toxicity and the various concentrations of the chemical. It appears that at high concentrations death occurs very rapidly, but that as the concentration decreases the toxicity becomes less. Moreover, the toxicity decreases, not in direct proportion to the concentration, but in a kind of geometric proportion. At very low concentrations (1%) the beetles can withstand the fumes for a long time.

The objection may be raised that the data here given do not represent the toxicity of given concentrations of substance, but the *time* required for the substance to reach a toxic concentration in an inclosed space. But this is chiefly an academic objection. If seventy minutes are required for a 1% solution of trimethylamine to fill 125 cc. of space with enough gas to kill a beetle, the result is practically the same as if a low concentration, held constant, brought about the same result. The effect is the same in either case.

There is some indication that, in low concentrations, trimethylamine actually attracts Necrophori. Several specimens kept in an experimental cage, were trapped twice as frequently with this as with pure water. Beetles also tore a piece of cotton soaked with the chemical and left in their cage.

Dead bodies lying in the open must be comparatively free from high concentrations of so volatile a substance as trimethylamine. In a confined space the situation is different. It is the custom of collectors to trap necrophilous beetles in jars sunk in the earth and containing scrap meat. In such jars Necrophori, as well as other beetles, are often found dead, even when the decaying flesh is not sufficiently liquified to produce drowning. Such jars have a strong odor of ammonia, which doubtless, in many cases, is due to the presence of trimethylamine.

A SINGULAR CREMATOGASTER FROM GUATEMALA

By William Morton Wheeler

Among a number of ants which I collected during the spring of 1935 in Guatemala one of the Crematogasters is so unusual that it merits special description. Two colonies of these insects were found while I was collecting with Dr. Marston Bates on March 19 (which happened to be my seventieth birthday) along the northern shore of the exquisitely beautiful Lake Atitlan. Each colony was nesting in the soil under a stone, one in an open sandy spot a quarter of a mile south of the hotel at Tsanjuyo, the other in a grassy meadow about a mile farther on, near the village of Panajachel. The approximately equal populations of both these colonies comprised males, females, workers and brood. The extraordinary appearance of the males, which were small, wingless, slow-moving creatures with conspicuous white thoraces and clung huddled together on the lower surface of the stone when they were not being carried about by the workers, led me to collect as many specimens as possible of the adults and brood of all the castes. It was the very height of the dry season, and further search in the two localities revealed no other colonies of this ant or indeed of other species, except a few colonies of the fire-ant (*Solenopsis geminata* Fabr.) and of certain common forms of Pseudomyrma and Camponotus, which were nesting in the dead branches of the trees and shrubs.

Comparison of specimens from the two Crematogaster colonies with other Neotropical species of the genus shows that the workers are so similar to those of *C.* (*Orthocrema*) *sumichrasti* Mayr that, apart from coloration, no important differences can be detected. The worker and female of the typical *sumichrasti* from Mexico are yellow, whereas the corresponding castes of the Atitlan form are dark brown or

black. The male of the latter also differs from the male *sumichrasti* in having the thorax and pedicel ivory white, instead of yellow and the head and gaster more deeply infuscated, and both the male and the female are *completely apterous, even in the pupal stage*, instead of possessing well-developed wings like *sumichrasti*. Many years ago (1884), Forel described the worker and female (presumably winged or deälated) of a form of *sumichrasti* collected by Stoll at Antigua, Guatemala, as subsp. *surdior*. Two worker cotypes of this ant in my collection show that the body is pale reddish castaneous and hence intermediate in color between the typical *sumichrasti* and the form from Lake Atitlan. Yet the aptery of *both* sexual castes of the latter, a condition unique among all known Formicidæ, suggests two problems, one involving the interpretation of the constitution of the colony as a whole, the other purely taxonomic. In other words, we are led to inquire whether the personnel of each of the colonies which I collected consists of a single independent, or of two different species, living in host and parasite relation. Either a positive or a negative answer to this question necessarily implies the further question as to the taxonomic status of the Atitlan specimens.

That we are dealing with only a single form in each of the two colonies is indicated by the following considerations:—

(1) Apart from coloration, which can have only varietal significance, and the aptery of the two sexual castes, which to the taxonomist is a more important character, there is very little to distinguish the Atitlan form from *sumichrasti*.

(2) The darker color of the worker and female and the aptery of both sexual castes might be interpreted as mutations that have survived in a peculiar xerothermal environment. This is suggested by the fact that the colonies were nesting in the ground in exposed situations, whereas all or nearly all the other known species of the subgenus Orthocrema are forest ants which nest in plant-cavities. This is true even of the typical *sumichrasti* and its subsp. *surdior*. The type colony of the latter, according to Forel, was found attending aphids under the leaf-sheaths of a banana plant, and recently Dr. Skwarra (1934, p. 120) has recorded the

following sites in which she observed the typical *sumichrasti* nesting in various Mexican localities: in the trunk of a tree, in the stem-cavities of *Cecropia mexicana,* under the leaf-bases of bananas, in the stems of the Melastomaceous plant *Conostegia xalapensis,* in the pseudobulbs of the orchid *Schomburgkia tibicinis,* and most frequently between the overlapping leaves of Bromeliads, namely, *Aechmia mexicana* and the following species of Tillandsia: *Balbisiana, dasyliriifolia, pruinosa, streptophylla, Valenzuelana* and *viridifolia.* Forel (1908) records the typical *sumichrasti* as having been taken by Biolley at San Jose, Costa Rica (1160 m.) in decayed wood. The very different habitat of the Atitlan colonies might account for the deeper pigmentation of all three castes and, perhaps, for the aptery of the males and females. The physiological causes of aptery in insects, however, are apparently obscure and very diverse. To contend that the "genes for winged" have completely dropped out of the germ-cells of these ants would be merely, if a mixed metaphor may be permitted, to make a "Ruhekissen" out of a photograph of the problem.

It is more probable that each of the Atitlan colonies is a mixture of two species, one of which, comprising the apterous males and females, is an undescribed workerless parasite, the other an undescribed subspecies of *C. sumichrasti,* represented only by the workers and functioning as the host.

(1) In the field the depauperate appearance of the colonies and the peculiar males at once suggested this interpretation, because Crematogaster colonies containing young sexual individuals are, as a rule, very populous. According to Dr. Skwarra's observations, those of the typical *sumichrasti* even contain several mother queens, frequently as many as 16 to 20, and are probably of pleometrotic origin. She mentions one colony which comprised 31 deälated females and 962 workers, and another 164 deälated females and about 1200 workers. These are by no means unusually large colonies compared with those of many other species of Crematogaster. As shown in the following table, however, the combined populations of the two Atitlan colonies, including their brood, are very meager:

Workers (adult)	224
Workers (callow)	6
Workers (pupal)	1
Females (adult)	4
Females (callow)	17
Females (pupal)	21
Males (adult)	139
Males (pupal)	46
Larvæ and semipupæ (mostly or all males)	60
Total	518

Since the two colonies were of about the same size the workers in each averaged about 115 and were therefore only a ninth or a twelfth as numerous as in the two well-developed *sumichrasti* colonies observed by Dr. Skwarra.

(2) Closer scrutiny of the preceding table yields even firmer support for the contention that the wingless males and females are parasites, because in genera of workerless parasites, of which Wheeleriella and Anergates may be regarded as typical, the host queen is assassinated either by her own workers or by the intrusive queen and the brood of the host species is therefore lacking. It will be seen from the table that there were only one pupal and six callow workers in the two colonies. Of the 60 larvæ and semipupæ mentioned at the end of the list, the semipupæ, which numbered 36, are undoubtedly, and the 24 larvæ, which are too small to exhibit sexual characters, are very probably all or mostly males. Of the four adult females, three were taken from the colony near Panajachel, and one from the colony near Tsanjuyo. The latter, in all probability, is the original mother of all the larval, callow and adult sexual forms of that colony, but whether the other colony contained three mother queens or whether two of them were her mature daughters cannot be determined, owing to their equally deep pigmentation and complete aptery. Dr. Skwarra's observations on the pronounced pleometrotic proclivities of the typical *sumichrasti* suggest that all three queens may have been the mothers of the males, females and brood of the colony near Panajachel.

(3) The foregoing interpretation is supported also by the putative parasitism of several other species of Crematogaster. As early as 1910 I called attention to the species of the Ethiopian, Malagasy and Indomalayan subgenus Oxygyne, in which the females have peculiar falcate mandibles, as probably being temporary social parasites in the nests of other species of Crematogaster.[1] This statement would seem to apply also to two other Ethiopian subgenera, Atopogyne and Nematocrema. The females of the former have large rectangular heads and robust subfalcate mandibles, while the females of Nematocrema resemble those of Oxygyne. *Crematogaster acuta* Fabr., a rather common Neotropical species, which Emery regarded as the type of the subgenus Crematogaster *sens. str.* (Santschi's subgenus Eucrema), has small females, with small gaster like that of the worker, and with smooth integument quite unlike that of the worker, and is therefore, in all probability, a temporary social parasite. More suggestive in this connection are two species (*kennedyi* and *creightoni*) of the subgenus Acrocœlia which I described recently (1930, 1933) from nests of our common North American *C.* (*A.*) *lineolata* Say as workerless parasites. Except in possessing well-developed wings they are strictly comparable to the females and males of the Atitlan colonies. Obviously in all three cases we are dealing with parasites that are phylogenetically descended from their respective host species and have completely lost their worker caste.[2] This derivation seems to be more recent in the North American Acrocœlias than in the Atitlan form since in the latter both castes have lost their wings. The series of other known workerless parasites suggests that aptery develops sooner in the male than in the

[1]Emery (1897) described and figured an old mother queen of *Oxygyne ranavalonœ* Forel of Madagascar as strongly physogastric like the old mother queens of *Anergates atratulus*.

[2]For an account of the considerable number of Aculeate parasites that may be derived phylogenetically from their host genera or species see my paper of 1919. The parasitic Vespids, *Vespula austriaca, omissa* and *adulterina* and the parasitic bumble-bees of the genus Psithyrus are strictly comparable with the winged workerless parasites among ants belonging to the genera Wheeleriella, Epœcus, Labauchena, Pseudoatta, Sympheidole, Epipheidole, Gallardomyrma, etc.

female. Thus in *Bruchomyrma acutidens* Santschi, an Argentinian parasite of *Pheidole nitidula strobeli* Santschi, the female has large though veinless wings but the wings of the male are considerably reduced; in the Congolese *Anergatides kohli* Wasmann, a parasite of *Pheidole megacephala melancholica* Santschi, the wings in the female are like those of *Bruchomyrma,* but the male is subapterous, and in the well-known European *Anergates atratulus,* which parasitizes *Tetramorium cæspitum,* the female has well-developed, veined wings, but the male is completely apterous. The final stage is represented by the Atitlan Crematogaster, in which, as I have repeatedly stated, both sexual castes are apterous. Nevertheless, the loss of the wings seems to have been so recent that it has affected neither the volume and structure of the thorax nor the volume of the wing-musculature. Mating in this form must, of course, occur in the nest and between brothers and sisters (adelphogamy), as in Anergates, but there can be no dissemination flight as in that species. The females, as soon as they are mature and have been fecunded, very probably wander away from the nest singly, and, in order to insure the rearing of their brood, enter and secure adoption in weak colonies of the host species.

We have still to consider the taxonomic status of the Crematogasters discussed in the preceding paragraphs. The complete aptery of the sexual phases, whether we regard them as representing an independent species or as cospecific with the workers, is a character of sufficient importance to justify the erection of a new subgenus. Since I have interpreted the sexual forms as workerless parasites I propose the name *Apterocrema* subgen. nov. for the males and females and describe them below as a new species, *atitlanica.* The workers, however, would belong to a new subspecies of *sumichrasti,* for which I propose the name *maja,* allied to Forel's subsp. *surdior* and therefore belonging to the subgenus *Orthocrema.* Should the future investigator succeed in demonstrating that the sexual castes and workers are cospecific, he might be willing to retain my subgeneric name, but *maja* would, of course, become a synonym of *atitlanica.*

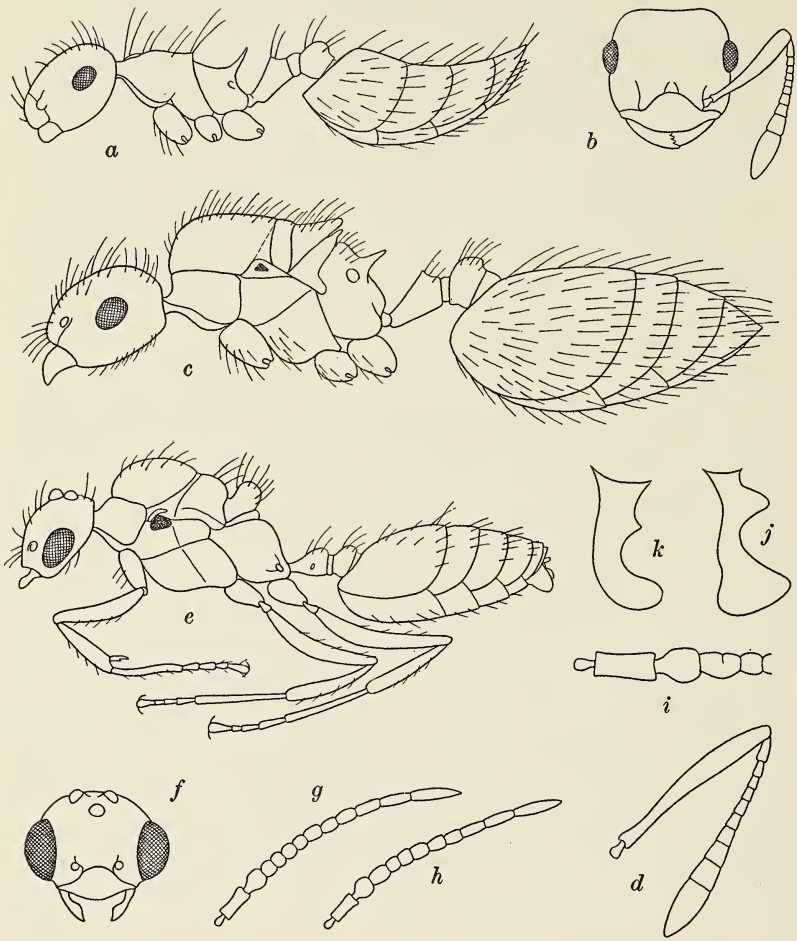


Fig. 1. *a*, *Crematogaster* (*Orthocrema*) *sumichrasti maya* subsp. nov. Worker in profile; *b*, head of same, dorsal view; *c*, *C.* (*Apterocrema*) *atitlanica* sp. nov. female in profile; *d*, antenna of same; *e*, male in profile; *f*, head of same, dorsal view; *g*, 12-jointed left and *h*, 11-jointed right antenna of same male specimen; *i*, four basal joints of another male specimen more enlarged, showing partial division of third joint; *j*, volsella of male *atitlanica*, *k*, volsella of male *sumichrasti* (typical).

Crematogaster (Apterocrema) atitlanica sp. nov.

Female. Length: 4.3-4.5 mm.

Very similar to the female of *sumichrasti* but differing in the following characters: Head slightly narrower in proportion to its length; eyes distinctly larger, very nearly as long as their distance from the anterior corners of the head; clypeus more flattened in the middle anteriorly, between the carinæ, which are sharper than in *sumichrasti.* Wings absent, but tegulæ of fore wings persisting as minute, elongate scales articulated to a small, heavily sclerotized and, in the pupa and callow, black area. Epinotal spines longer and usually more slender and more acute than in *sumichrasti.* Petiole and postpetiole narrower and less robust.

In sculpture and pilosity very similar to *sumichrasti,* but the rugosity of the sides of the epinotum is sharper, as is also the punctuation of the petiole and postpetiole, the latter also longitudinally striolate. The sparse golden pilosity is as in *sumichrasti,* very long and conspicuous on the gaster and dorsum of the pedicel, thorax and head, shorter but coarse on the scapes, gula and legs.

Black or very dark brown; thorax and pedicel in less mature specimens reddish brown, especially along the sutures; legs and antennæ dark brown; mandibles, tips of scapes, clubs of funiculi, coxæ, trochanters, tarsi and posterior borders of gastric segments brownish yellow.

Male. Length 2.5.–2.8 mm.

Structurally very similar to the male *sumichrasti.* Integument thin and collapsible. Mandibles and antennæ as in *sumichrasti,* the former small and acute but edentate, the latter usually 11-jointed, with the third joint (second funicular) entire or partially divided, sometimes 12-jointed, when the division is complete, more rarely 10-jointed. The three terminal joints are apparently stouter than in *sumichrasti.* Thorax wingless; with vestiges of tegulæ as in the female. Volsella of genitalia much more expanded at the tip than in the male *sumichrasti.*

Sculpture and pilosity as in that form. Ivory white; head, except the clypeus, mandibles and mouthparts, dark brown, especially posteriorly; tibiæ and gaster paler brown, segments of the latter dull yellowish at the base and along

their posterior borders. Thorax with a conspicuous small black spot on each side at the tegular insertions as in the immature female and also as in the male *sumichrasti.*

Crematogaster (Orthocrema) sumichrasti maya subsp. nov.

Worker. Length 3–3.3 mm.

Very similar to the typical *sumichrasti* but differing as follows: Clypeal carinæ more pronounced, antennal scapes extending only 1/5 their length beyond the posterior border of the head (in *sumichrasti* ¼); lateral marginations of mesonotum and denticles at its posterior end more pronounced as in the subsp. *surdior;* epinotal spines longer and more distinctly recurved; petiole more narrowed anteriorly.

Sculpture as in *sumichrasti* but the mandibles more coarsely striated and more opaque and the pronotum longitudinally rugulose.

Pilosity yellow as in *sumichrasti* and very long, especially on the thorax and gaster.

Black or brown black, much darker than the subsp. *surdior;* mandibles, club of antennæ, trochanters and tarsi brownish yellow.

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NEW AND LITTLE-KNOWN NEOTROPICAL STRATIOMYIDÆ (DIPTERA) IN THE MUSEUM OF COMPARATIVE ZOOLOGY

By Maurice T. James

Colorado State College

A small collection of Neotropical Stratiomyidæ, kindly sent to me by Dr. Nathan Banks, contained a number of interesting species, several of which are here described as new. All types are being returned to the Museum of Comparative Zoölogy, Cambridge, Mass.

Monacanthella, new genus

This genus is proposed for the reception of a remarkable species which may readily be distinguished from other described Clitellariinæ by the peculiar structure of the scutellum; instead of being unspined or with paired spines, as in other members of this sub-family, the scutellum terminates in a single, median, conical spine, which is elevated at a slight angle to the rest of the scutellum. The exact relationship of this genus is hard to determine; in its slender form and general type of wing venation, it suggests *Meringostylus,* though the antennæ are quite different.

Diagnosis. Female. Eyes dichoptic, separated by two and one-half times the width of the ocellar triangle, bare; front of equal width; the face broadening out toward the oral margin. Ocellar triangle somewhat longer than wide, removed some distance from the occiput. Antennæ situated somewhat below the middle of the head in lateral profile, but remote from the oral margin; ten-segmented, the first three subequal, the subsequent ones gradually decreasing in length; segments one and two distinct, each with a number of apical hairs on each side; segments three to seven inclusively distinctly separated, each segment with a subbasal hair on each side, and bearing sensory pits; segments eight

to ten inclusively indistinctly separated and without sensory pits; a subbasal hair on each side of each of these segments, and, in addition, on segment ten, a more conspicuous apical bristle and two subapical ones. Proboscis short, flattened dorso-ventrally. Mesopleura conspicuously narrowed in front. Legs elongate, the coxæ three or four times as long as the trochanters. Wings slightly longer than the abdomen; veins R $_{2+3}$ and R_4 longer than, cross-vein r-m almost as long as, the width of the discal cell; the discal cell slender, veins M_1 and M_2 arising together at its apex; the branches of the media, cubitus, and anal veins distinct almost to the posterior wing margin; cell 2nd A elongate and definitely narrower than 1st A. Abdomen five-segmented. General body form elongate, the entire body being six or seven times as long as wide.

Genotype: *Monacanthella gracilis,* new species.

Monacanthella gracilis, new species

Female. Most of front, vertex, including the ocellar triangle and the ocelli, occipital orbits, and occiput above, shining black, the occiput below the foramen becoming brownish yellow; occipital orbits prominent above, with somewhat of

Fig. 1.

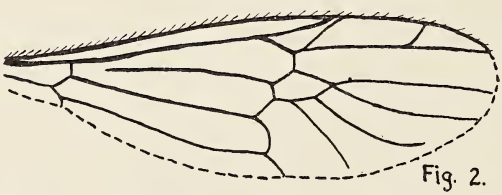


Fig. 2.

FIG. 1. *Monacanthella gracilis,* n. sp. Antenna.

FIG. 2. *Monacanthella gracilis,* n. sp. Wing.

a bluish sheen, narrower behind the eyes; the front just above the base of the antennæ, face, and proboscis yellow; antennæ yellow, darkening apically. Thorax yellow, with mere vestiges of three black stripes anteriorly; minutely

punctured or rugulose dorsally; scutellum and spines yellow. Abdomen yellow in ground color; segments two to five inclusively with extensive blackish markings dorsally, which on segments two, four and five nearly cover the tergites, except for the lateral margins and a basal triangle on each side; the black on segment three similar, except that the apical two-fifths of the tergite is wholly yellow; venter yellow. In addition to these segments, four genital segments form a rather slender ovipositor which terminates in a pair of cerci that extend some distance beyond their segment. Legs yellow; the posterior femora narrowly darkened apically and basally; the hind tibiæ darkened on their inner sides. Wings grayish brown, paler basad of the arculus and beyond vein R_4; also a median pale band running from the position of the stigma across the apices of the two basal cells and the base of the discal cell, and terminating in the wing margin in the fifth posterior cell; the veins crossed by this band, including cross-vein r-m, white; the veins otherwise brown. Pile of entire body very sparse, yellow. Length, 7 mm.

Holotype: female, Hamburg Farm, Costa Rica, April 6 (C. W. Dodge).

Microchrysa abdominalis, new species

Male. Head and thorax bright metallic green, with cupreous reflections in certain lights; antennæ bright yellow; the proboscis, humeri, wing-bases, and a region below and behind each wing base, including the pteropleura, metapleura, and metanotum, pale yellow, not metallic; a narrow pale yellow stripe connecting the humeri and the wing bases; the extreme apex of the scutellum yellow; postscutellum yellow. Halteres yellow, the knobs whitish. Legs and abdomen pale yellow, the latter with abundant, but short, appressed pile, which is black above, yellow below. Wings hyaline; stigma and strong veins yellow. Length, 3 mm.

Female. Front broader than face, metallic green. Abdomen variable: typically, it seems to be yellow, with a strong metallic green reflection over the greatest part, though two specimens seem to be metallic green in ground color, with a variable amount of non-metallic yellow basally and laterally. Otherwise as in the male.

Holotype: male, Ancon, C. Z., July 15, 1924, No. 685 (W. M. Wheeler).

Allotype: female, Los Amates, Guatemala (Kellerman).

Paratypes: 1 male, 1 female, same data as holotype; 1 male, same data as allotype; 1 male, Gamba, C. Z., 1924 (N. Banks).

Teneral specimens, not designated as types: 1 male, Canal Zone, June 30, 1924 (Banks); 1 male, Hamburg Farm, Costa Rica, April 6 (C. W. Dodge).

Kertesz, in his catalogue of the Diptera, refers *Sargus bicolor* Wd. to *Microchrysa*, and Wiedemann's description of the species, as far as it goes, fits *abdominalis*. However, Curran (1931) has shown that *S. bicolor* belongs to a different genus, quite remote from *Microchrysa*, which he has named *Neurota*. *M. abdominalis* is in all respects a typical *Microchrysa*.

Isosargus lateralis, new species

Related to *I. texanus* Melander and *I. nigricornis* Loew; but readily distinguished from both those species by the yellow pleura. If *Microchrysa nova* G. T. is an *Isosargus*, as the description would indicate, it also belongs in this related group of species; but, like *texanus* and *nigricornis*, it also has metallic green pleura.

Female. Upper part of front and entire vertex metallic green; the pile short, pale; some longer pile, pale and black intermixed, on the vertex; the usual supra-antennal cross-band white; face yellow, becoming blackish toward the oral margin; its pile short, pale. First and second antennal segments yellow, black-pilose; third segment orange; arista yellow, with a very few black hairs at its extreme base. Proboscis orange. Dorsum of thorax metallic green, the humeri and extreme apex of the scutellum yellow; its pile yellowish to white; pleura yellow, the margin from the humeri to the wing-bases white; pectus black, non-metallic. Abdomen wholly metallic purple; dorsally, with short stubby black pile, ventrally with softer, semi-appressed yellow pile. Legs wholly pale yellow; the coxæ slightly darkened; pile concolorous, except for a little black pile on the apical tarsomeres. Wings grayish hyaline; venation nor-

mal; veins black; basal section of the media, and branches M_1 and M_3 somewhat weakened. Length, 6.5 mm.

Holotype: female, Barro Colorado Island, Canal Zone, June 20, 1924 (N. Banks).

The apex of the abdomen is somewhat eaten by dermestids, but the specimen, except for the lack of genitalia, is not materially damaged.

Merosargus banksi, new species

Related to *ethelia* Curran, but, among other things, the face is wholly yellow, the metapleura are yellow, there is a prominent black spot on each mesopleuron, and the abdomen is differently marked.

Male. Vertex and front above black; the usual transverse white band broad; front below this band, and all the face, proboscis, and palpi, pale yellow. Head pale-pilose. First and second antennal segments yellow, black-pilose; the third orange; arista brownish to black, bare. Front with a median, somewhat raised, polished vitta, extending from the white transverse band to the ocelli; frontal orbits conspicuously and moderately coarsely punctured. Thorax metallic green shining on a black background dorsally, yellowish on the sides of the mesonotum, the black background extending to the lateral margins at the suture; scutellum, except the narrow apex, and metanotum, metallic green; a triangular non-metallic black spot on each mesopleuron; otherwise yellow. Legs yellow; the apical third of the posterior femora black; the posterior tibiæ, except for the median third, black; middle tibiæ blackish at the base. Pile of the thorax and legs pale, except for a little black pile on the apical tarsomeres. Abdomen black, with bluish or purplish reflections; the bases and apices of all segments yellow; pile concolorous with the background. Genitalia yellow. Venter brownish-yellow, with pale pile. Wings hyaline; veins black. Length, 7 mm.

Holotype: male, Barro Colorado Island, Canal Zone, June 23, 1924 (N. Banks).

Merosargus abana Curran

Three males, though considerably different from the females of this species, probably belong here. They bear

the same data as Curran's types, and are associated with a female which fits his description perfectly, except that the pale pile of the mesonotum somewhat overshadows the black pile, and that the color of the mesonotum is more diluted. Structurally, the males are the same, the differences being color differences, which, in this genus, are unreliable indicators. The differences are as follows:

Dorsum of thorax, scutellum, a spot on each mesopleuron anterior to the wing base, and metapleura black; tibiæ, tarsi except the posterior basitarsi, and basal half of posterior femora, black; first and second abdominal segments, except the apex of the latter, black; the abdomen, therefore, is black, with the narrow apices of segments two and three, and the posterior angles of four, pale.

1 female, 3 males, Sa. Emilia, Pochuta, Guatemala, 1000 m., Feb.-Mar., 1931 (J. Bequaert).

Acanthinomyia pulchella, new species

A handsome species, readily distinguished from the other described species of this genus by the hyaline wings, the less elongate form, the more sparsely pilose eyes, the lack of an area of differentiated pile on the eyes, etc.

Male. Head entirely reddish yellow, except the occiput and the ocellar triangle; the former, however, is broadly margined with yellow. Eyes reddish yellow, their pile long and moderately sparse, black on the upper, yellow on the lower half; there is no area of longer, thicker pile as in the other species of the genus. Antennæ yellow, somewhat shorter than the head. Pile of head yellow, except for the longer, black pile of the vertex, and a fringe of dense, appressed, silvery white pile bordering the front and face along the inner margin of the eyes. Thorax black, robust, clothed with dense, semi-appressed, straw-yellow pile, and, in addition, on the dorsum, with sparse, erect, rather long, black pile; on the dorsum are four black stripes, lacking the appressed pile, which extend from the anterior margin of the mesonotum to the base of the scutellum; the two outer stripes end just beyond the outer basal angles of the scutellum; the median ones extend onto the disc of the scutellum and fuse there. Scutellum and its four spines black, the

latter red on their apical half, yellow-tipped; the spines are set on the definitely margined apex of the scutellum. Abdomen black in ground color, except the apices of segments four and five, which are red, ventrally and dorsally; a considerable amount of black appressed pile on the median three-fourths of segments one to three inclusively, a little of this extending onto the base of segment four; segments one to three laterally, segment four for the most part, and segment five wholly, with straw-yellow pile, that of the venter being entirely pale and almost white. Legs mostly blackish or reddish-black, the extreme apices of the femora and bases of the tibiæ, and the middle basitarsi, yellow; pile yellow, that of the inner sides of the tarsi golden. Wings yellowish hyaline, the veins distinctly yellow; cross-vein r-m very short, almost wanting, the discal cell with an appendiculate extension in that direction. Stigma distinct, yellow. Length 5.5 mm.

Holotype: male, Cordoba, Mexico (Mann).

Although this species does not agree with all the diagnostic characters of the genus as given by Kertesz in his *Monograph of the Notacantha*, as the foregoing description will indicate, still I can see no reason for not placing it here.

DESCRIPTIONS AND RECORDS OF NEARCTIC MECOPTERA

By F. M. Carpenter

Museum of Comparative Zoölogy

During the past year so many unusual and interesting Nearctic Mecoptera have come under my observation that it seemed justifiable to publish an account of them at this time, even though another summer will probably add to the list. The most remarkable collection which I have yet received for determination was sent by Professor O. L. Cartwright, of Clemson College, South Carolina. Included in this lot were the females of three species (*flexa*, *banksi*, and *acuta*) previously known only from males; a long series of specimens of a species (*flexa*) formerly known solely from the holotype; another long series of a second species (*banksi*), which, although described forty years ago, has been known only from 3 specimens; and 5 species not previously recorded from the state of South Carolina. Other specimens forming the basis of this paper have been received from Professor R. C. Smith and Professor H. B. Hungerford of Kansas, Professor H. E. Jaques, Iowa Wesleyan College, and Mr. Robert Goslin, Lancaster, Ohio. To these entomologists I owe many thanks for the opportunity of studying their material.

Family Panorpidæ

Panorpa flexa Carp.

Figure 3

Psyche, 1935, 42:108, fig. 2.

This species was described from a single male collected in the Smoky Mountains, N. Carolina. Among the Mecoptera sent by Professor Cartwright there are 3 males and 7 females from North and South Carolina, as follows:

SOUTH CAROLINA: 1 ♀, Rocky Bottom, Pickens Co., May 5, 1934 (O. L. Cartwright); 1 ♀, Rocky Bottom, May 31, 1933 (O. L. C.); 1 ♀, Rocky Bottom, June 1, 1933 (J. G. Watts); 1 ♂, Pinacle Mt., June 19, 1934 (O. L. C.); Earls' Ford, Pickens Co., July 8, 1933 (O. L. C.). NORTH CAROLINA: 2 ♂, 1 ♀, Sunburst, June 30, 1935 (O. C. L.); 1 ♀, Sunburst, June 14, 1934 (O. L. C.).

The wing membrane of the holotype of *flexa* was colorless, but the wings in the additional specimens show a surprising variation in color, surpassed in Panorpa only by that in *P. canadensis*. In half of the specimens listed above the wing membrane is colorless, and the markings are much reduced; whereas in the rest of the specimens the membrane is yellow and the markings are strongly developed. The female is similar to the male in coloration and markings. The internal skeleton within the 9th abdominal segment is large and resembles that of *sigmoides*, but differs in the curvature of the projecting part of the axis. In the key to the females of *Panorpa* contained in my revision of the Nearctic Mecoptera (Bull. Mus. Comp. Zoöl., 72: p. 225, 1931), *flexa* will run to couplet 15, and can be distinguished from the other species included there only by the structure of the internal skeleton. The female from Sunburst, N. Carolina, June 14, 1934, is designated as the allotype and deposited in the Museum of Comparative Zoölogy.

Panorpa anomala Carp.

Bull. Mus. Comp. Zoöl., 1931, 72:245.

Since this species has previously been known only from the types collected in Leavenworth and Douglas Counties, Kansas, it is of unusual interest to have the species turn up in Arkansas (Washington Co., May 21, 1928). Several specimens of both sexes from that locality were sent to me by Professor R. C. Smith. This record indicates that the species probably also occurs in Missouri and Oklahoma, from both of which states I have seen almost no specimens of Panorpa.

Panorpa venosa Westwood.

Trans. Ent. Soc. London, 1846, 4:190.

Four specimens of this species collected in Jones and

Madison counties, Iowa (June 9, July 7, 1932), were sent to me by Professor H. E. Jaques. These are the first specimens which I have seen from that state, though Ebsen-Petersen recorded it many years ago from there.

Panorpa banksi Hine

Figure 2

Trans. Ent. Soc. Amer., 1895, 72:315 (*affinis* Banks, nec Leach).

This rare species has previously been known only by the male type, which was collected in New York State, and two males from Pickens County, S. Carolina, recorded in my revision (1931). In the material recently sent by Professor Cartwright, there are 7 males and 1 female, all from Rocky Bottom, Pickens Co., S. Carolina: 4 ♂, 1 ♀, May 22, 1934; 1 ♂, June 21, 1933; 1 ♂, May 31, 1933; all collected by O. L. Cartwright and J. G. Watts. These new specimens are most interesting because all have the first marginal spot on the fore wings. This was a characteristic that I was unable to discern definitely in the type, which is a badly damaged specimen. Strangely enough, the two additional specimens which I saw from South Carolina in 1931 lacked the first marginal spot. The new material indicates that the absence of this spot is not a constant specific characteristic in *banksi*, although in all other Nearctic species of Panorpa so far known the presence or absence of the marginal spots is perfectly constant in at least 99% of the specimens.

The female of *banksi*, which is now known for the first time, is like the male in coloring. The internal skeleton of the 9th abdominal segment is large, but is unusual in possessing a very short axis, which does not project beyond the plate. The female collected at Rocky Bottom, Pickens Co., May 22, 1934, is here designated as the allotype and is deposited in the Museum of Comparative Zoölogy. In my key to the females of Panorpa (1931, p. 225), this specimen runs to couplet 18, where it is readily separated from *rufescens* and *interrupta* by the structure of the internal skeleton; but females lacking the first marginal spot, should any

turn up, will run to couplet 15, where the internal skeleton will again provide easy recognition.

Panorpa submaculosa Carp.

Bull. Mus. Comp. Zoöl., 1931, 72:255.

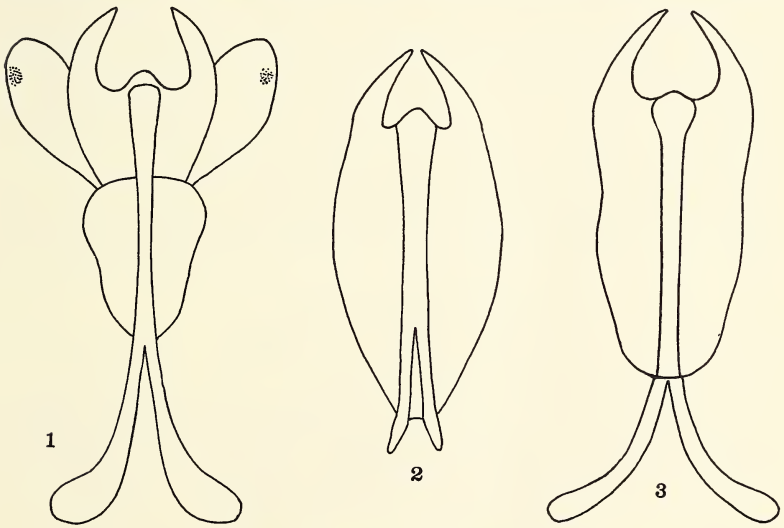
Eleven specimens of this species were included in the collection sent by Professor Cartwright, ten from S. Carolina (Pickens Co., May 31, 1933), and one specimen from Georgia (Raburn Bald Mt., Raburn Co., June 13, 1933). These are the first records of *submaculosa* in either state, and they greatly extend the range of the species, which has previously been known only from Michigan, New York, Ohio and Maryland.

Panorpa acuta Carp.

Figure 1

Bull. Mus. Comp. Zoöl., 1931, 72:253.

Nine specimens of *acuta* taken in S. Carolina (Pickens Co., May 31, June 21, August 25), and 3 in Georgia (Raburn Bald Mt., Raburn County, June 13) were sent by Professor Cartwright. These constitute the first record of the species



Figs. 1-3. 1. Internal skeleton of 9th sternite of *Panorpa acuta* Carp. (allotype). 2. Same of *Panorpa banksi* Hine (allotype). 3. Same of *Panorpa flexa* Carp. (allotype).

in those states. Three of these specimens being females we are able to determine satisfactorily the structure of the internal skeleton. In all other localities at which *acuta* has been collected, very similar species (such as *maculosa* and *nebulosa*) have also occurred, and in view of the relative scarcity of specimens of *acuta,* it has not been possible previously to identify the female of that species. As I pointed out in 1933, although I had seen 75 males from scattered localities, I was not certain of the female. But the three females sent by Professor Cartwright were taken with the males of *acuta,* and no other species resembling *acuta* was secured at that locality. An examination of the ninth sternite of the female and of the internal skeleton shows several points of difference from those structures in *nebulosa.* It is now clear that several of the females of the *nebulosa* group which I have previously seen were *acuta,* though it was not possible to correlate the sexes. This has now been done. The internal skeleton is close to that of *nebulosa,* but the axis projects further beyond the plate, which is also distinctly shorter. Furthermore, there is a supplementary plate which adheres to the inner surface of the 9th sternite, and which bears two black spots; these spots can be seen faintly through the sternite itself, when the insect is examined under a bright light. This supplementary plate is like that of *latipennis,* but in the latter it is situated further posteriorly. *Latipennis* and *acuta* are the only known species which possess this supplementary plate.

The female collected at Rocky Bottom, Pickens Co., S. Carolina (June 21, 1932), is here designated as the allotype and is deposited in the Museum of Comparative Zoölogy.

Family Bittacidæ

Bittacus strigosus Hagen

Synop. Neur. N. Amer., 1861, p. 246.

One male of this species, contained in Professor Cartwright's collection, is the first record from South Carolina (Clemson College, June 27, 1931).

Bittacus stigmaterus Say

West. Quart. Rep., 1823, 2:164.

One male, collected at Clemson College, S. Carolina (July

8, 1932) by O. L. Cartwright, is the first record for that state.

Bittacus occidentis Walker

Cat. Neur. Brit. Mus., 1853, p. 468.

Two specimens were collected at Clemson College, S. Carolina, September 14, 20, 1932, by O. L. Cartwright. This is the first record in the state.

Family Boreidæ

Although no new species of Nearctic Boreus have come to my attention during the past year, a great many specimens have been received, some belonging to species which have previously been little-known. Of particular interest is a long series of both sexes of *gracilis,* which was described only from two females. The new females show that the type specimens of this species were slightly damaged to the extent that the long hairs covering the body had been rubbed off, producing the effect of a short pubescence. Since the nature of the pubescence was one of the characteristics which I made use of in my previous key to the females of Boreus (Psyche, 42:112, 1935), undamaged specimens of *gracilis* will not run to that species. In this connection, also, I wish to correct certain errors which were introduced into the above mentioned key. In some way the statements in couplet 7 were confused with those of couplet 6, and the changes escaped my notice in the proof. The descriptions of the species concerned are of course correct, but for the sake of clarity and to correct the position of *gracilis,* I include here another key to the females of the Nearctic species of Boreus.[1]

Key to the Females of Boreus

1. Fore wing reduced to a minute scar, similar to that of the hind wing.....*reductus* Carp.
   Fore wing in the form of a small oval pad.....2.
2. Wings and body the same color (brown or black).....3.
   Wings much lighter (yellow or yellow-brown) than body (dark brown or black) .....7.

[1]A typographical error in the key to the males of Boreus (ibid. p. 111) is also misleading: in the second line of couplet 1, the number should be "9" not "8."

3. Ovipositor short, only as long as rostrum.....4.
   Ovipositor distinctly longer than the rostum.....5.
4. Body either black or very dark brown.....*brumalis* Fitch.
   Body light brown or medium brown....*nivoriundus* Fitch.
5. Body covered with fine, white pubescence....*unicolor* Hine.
   Body covered with long, white or yellowish hairs.....6.
6. Wing pads somewhat brownish proximally; body above dull or with a very slight shine.....*gracilis* Carp.
   Wing pads entirely jet black; body above very shiny..... *nix* Carp.
7. Ovipositor scarcely longer than the rostrum..... *intermedius* Lloyd.
   Ovipositor one and one-half times as long as rostrum....8.
8. Body light brown or reddish brown....*californicus* var. *californicus* Packard.
   Body black or nearly so.....9.
9. Body black, but with a pronounced bronze hue, abdomen above exceedingly shiny.....*borealis* Banks.
   Body jet black; abdomen above with only a slight shine *californicus* var. *fuscus* Carp.

Boreus brumalis Fitch

Amer. Journ. Agric., 5:278, 1847.

The first Ohio record of this species was secured in 1933. Since that time Mr. Robert Goslin, one of the first to find the insect in that state, has been on the alert for additional material, and as a result has collected an astonishingly large number of specimens from Hocking and Fairfield Counties. In December (1935) he secured about 225 specimens, in January about the same number, and in February over 326 specimens, making a total of more than 775 individuals! In one day alone (Feb. 3) Mr. Goslin collected 159 specimens. The notes which Mr. Goslin made concerning his captures are particularly interesting in showing the activity of these insects in different temperatures. Many of the specimens were found actively walking about during early December before any snow had fallen; most of these were collected on moss. The majority of the specimens, however, were taken on snow on days when the temperature was not far from 32° F. On December 31, following a tempera-

ture of —12° F. the night before, only 3 specimens (all females) were found on the snow and one of these was dead. But apparently falling snow or rain does not interfere with the activities of these insects; on December 23, 1935, Mr. Goslin collected 19 specimens during the course of a light snow fall, and again on January 9th he secured 7 specimens during a light rain.

Several hundred living specimens of *brumalis* were sent to me by Mr. Goslin, at my request, in the hope that it would prove not too difficult to rear them. The insects lived for several weeks, some for more than a month, and a great many eggs were secured; but the eggs failed to hatch. The antics of the male in bringing about copulation are most amusing. After approaching to within about half an inch of a female, he suddenly leaps in the air and onto the back of the female, turning himself over in the process of the jump so that he alights on his own back. Even during the process of landing he grasps her with his hook-like wings around the thorax or abdomen, and then seizes the end of her abdomen with his genital forceps. By a sudden twist he upsets the balance of the female, struggles to his feet, and runs around actively with the female held upside-down on his own back. I do not believe that copulation actually begins until the male has righted himself. It usually continues for several hours, and I have observed some pairs remain *in coitu* for as much as 12 hours.

Boreus nivoriundus Fitch

Amer. Journ. Agric., 5:277, 1847.

Twenty-five specimens of this species were also collected by Mr. Goslin during December, January and February. As in other parts of its range, *nivoriundus* is not nearly so abundant as *brumalis*. Several living specimens were sent to me by Mr. Goslin, and their behavior during courtship and mating was similar to that of the preceding species.

Boreus intermedius Lloyd

Pan. Pacific Ent., 10:119-120, 1934.

Three additional specimens (1 ♂, 2 ♂) of this little-known species have been sent to me by Mr. Lloyd; they were collected at McCarthy, Alaska, April 29, 1935.

Boreus gracilis Carp.

Psyche, 42:118; 1935.

A series of ten specimens (3 ♂, 7 ♀) of this insect were sent to me by Mr. Lloyd. 1 ♀ was collected at Kennecott, Alaska, April 15, 1935; and the rest at McCarthy, Alaska, April 29, 1935. This series is particularly interesting because the species has previously been known only from the two female types, and it now turns out that the type specimens were slightly damaged. The male is 3 mm. long; uniformly black except for the eyes (which are either black or dark brown) and the wings, which are sometimes brownish; the body including the wings but not the pronotum is covered with rather long white pilosity resembling that of *B. nix,* but not quite so prominent; pronotum with two rows of very long black hairs; wings with the outer margin almost straight as in *B. elegans* Carp. (see Psyche, 42, fig. 8, p. 121); hypandrium deeply emarginate, as in *B. nix* Carp. (Psyche, 42, fig. 7, p. 121); rostrum one and one-half times as long as the eye. One of the specimens taken at McCarthy, Alaska, April 29, 1935, is designated as the allotype and deposited in the Museum of Comparative Zoölogy.

The female is correctly described in my original account of the species, except that the body is covered with the long pilosity mentioned in the male; apparently the two type specimens were so badly rubbed that only the bases of the hairs remained, giving the appearance of a fine pubescence. The size of the wing pads seems to vary slightly but in the specimens so far collected the pads are shorter than in the other Nearctic species of Boreus, except of course *reductus* Carp.

This insect resembles *B. nix* Carp., from Montana, but is readily separated by the nearly straight outer margins of the wings in the male. *Gracilis* is the first Alaskan species found which possesses an emarginate hypandrium.

A LIST OF THE WEST INDIAN DRYOPIDÆ (COLEOPTERA), WITH A NEW GENUS AND EIGHT NEW SPECIES, INCLUDING ONE FROM COLOMBIA

By P. J. Darlington, Jr.

Museum of Comparative Zoölogy, Cambridge, Mass.

Since 1927, when I published a paper on the West Indian "Helmidæ" or Helminæ (*Psyche* 34, pp. 91-97), a considerable amount of additional dryopid material has come to hand. Most of it has been collected by myself during a trip to Cuba, Jamaica, and Haiti which I was enabled to make from August to November, 1934, through grants from the Milton Fund and Atkins Foundation of Harvard University. This paper is to report upon this material and to bring our knowledge of the West Indian fauna up-to-date by listing the species, sometimes with critical comments. It does not pretend, however, to be a complete revision.

By the "West Indies" I do not mean to include Trinidad, which is South American both geographically and faunistically. Among the Dryopidæ, the genera Dryops, Elsianus, and Heterelmis occur in Trinidad (collected by me in 1929) but are not, at least as yet, known from the West Indies proper, and one of the Trinidad species of Helmis (*s. lat.*) belongs to a group not yet known from the West Indies. In my 1927 paper I stressed the relationship of the West Indian species with those of Texas. Actually, of course, many of the species show close relationship with Central America as well as Texas, and there are some South American elements in the Lesser Antilles. The West Indian fauna and that of the adjacent mainland are still so imperfectly known that there is not much point in discussing affinities in more detail, except to note that the West Indian fauna is certainly depauperate.

The absence of Dryopidæ in many rivers and brooks in the West Indies is a striking phenomenon, worth recording

in detail. In Jamaica I looked carefully for the family in several rivers and mountain brooks on the south slope of the main range of the Blue Mountains, in the Hope River near Kingston, and in several small, clear, rapid rivers near Ocho Rios on the north coast, but did not find a single specimen, although Dryopidæ are known from the island. I visited also the Rio Cobre above Spanishtown, which looked like good dryopid water but was too flooded for collecting. In Haiti I worked carefully in the river at Ennery and the brooks on Mt. Basil (northern Haiti), in the Rivière Cul de Sac and the Rivière Froide (near Port-au-Prince), and in various mountain brooks in the high Massif de la Selle (southeastern Haiti) up to over 6,000 ft. in the Rivière Blanche on the La Selle plateau, with equally little result. However, in the La Hotte region (southwestern Haiti) I found Dryopidæ in every river and brook examined, from the Ravine du Sud at Camp Perrin, under 1,000 ft., to a small brook at Desbarrière, just north of Mt. La Hotte, at about 4,000 ft., the highest running water I saw in the La Hotte region. Five genera and eight species of stream loving Dryopidæ were found in this region. Possibly extensive clearing of forests, resulting in heavy freshets, has eliminated the insects in places by tearing up the stream beds and destroying aquatic vegetation, while they survive where, as near La Hotte, the forest is mostly uncut or where conditions are favorable for some other reason.

The proportions given in my descriptions have been determined by actual measurements. The types of all new species are in the Museum of Comparative Zoölogy. I am much indebted to Mr. K. G. Blair for notes on some types in the British Museum.

Subfamily Psepheninæ

Psephenus Hald

Although this genus is not known from the West Indies, an understanding of its secondary sexual characters is important in dealing with its West Indian relatives. In *Psephenus lecontei* Lec. the ♂ differs from the ♀ as follows: average size smaller; prothorax less explanate at sides; pronotum less opaque; elytra slightly less distinctly

substriate; antennæ slightly longer, heavier, and more nearly serrate; maxillary palpi longer, heavier, with last joint more triangular; front and middle tarsi not dilated but with soles first 2 joints with numerous rather short, slender papillæ; middle coxæ much more approximate, mesosternum between them narrower and more acutely impressed; abdomen with 7 ventral segments (6th showing only at sides of 7th, in emargination of apex of 5th), not 6 as in ♀.

Pheneps n. gen.

Generally similar to Psephenus, but more slender; head free; coxæ similar; last tarsal joint elongate, but not quite so much as in Psephenus; epipleuræ similar, nearly reaching apex of elytra; sexual dimorphism of palpi, mesosternum, and apical segments of abdomen similar. Differs from Psephenus in clypeus and labrum nearly in plane of front, not bent under head; in very long antennæ reaching to near middle of elytra at least in ♂, with 1st joint long, slightly bent, slightly thickened, 2nd less than ½ as long, slightly thickened, 3rd about length of 1st, but more slender, about 4 times long as wide in ♂, outer joints gradually shorter, subserrate at least in ♂; differs also in sides of prothorax not explanate, and in basal joint front and middle tarsi ♂ enlarged as well as with papillæ, broadly oval, several times bulk of 2nd joint, deeply emarginate apically. Differs from Psephenops in very elongate antennæ and in 2d joint ♂ tarsi small, though with sexual papillæ as in Psephenus. The genotype is

1. **Pheneps gracilis** n. sp. (Pl. III, fig. 5)

Male only. Moderately slender, depressed; dark grayish brown, mouth, bases of legs, last (sometimes) and apices of some or all other ventral abdominal segments testaceous; upper surface finely and very inconspicuously punctate, with fine, short, more or less decumbent gray pubescence, the direction of which varies on the elytra to form an irregular, variable, sericeous pattern in some lights. *Head* not quite 3/5 width prothorax; eyes large and prominent; clypeus very wide, short, free at sides; labrum equally

wide and short; palpi and antennæ (♂) as described above. *Prothorax* transverse, about 2/3 wider than long, moderately narrowed anteriorly, apex about 3/5 width of base; sides more or less unevenly arcuate, nearly parallel basally, not margined, not explanate; base lobed before scutellum, broadly emarginate at sides; apex slightly arcuate anteriorly; basal angles acute posteriorly but not much produced, apical angles rounded-obtuse; disk more or less evenly convex, with faint longitudinal impressed line at middle near base. *Elytra* ample, together 3/10 wider than prothorax, sides slightly diverging in basal ½, broadly rounded to the independently rounded apices; surface with faint, irregular longitudnal impressions or striæ. Abdomen below with 2 basal segments deeply emarginate at middle, 1st entirely hidden by coxæ medially. Mesosternum and ♂ tarsi as described above. Length 4 or slightly more; width 2 or slightly more mm.

Haiti: holotype ♂ (M. C. Z. no. 21,785) and 5 ♂ paratypes (1 in U. S. N. M.) from Tardieu, in the valley just north of Mt. La Hotte (Pic de Macaya), about 3,000 ft., Oct. 14, 1934, taken with a light at night in depressions on stones in the turbulent Rivière Tardieu. The insects were a foot or so above water level on stones which were dry but entirely surrounded by water. They were apparently resting, but ran actively when disturbed. The ♀ characters of the genus have been taken from the following species:

2. **Pheneps cubanus** n. sp. (Pl. III, fig. 6)

Female only. Moderately slender, depressed; testaceous brown, paler below; upper surface dull and finely and densely roughened on pronotum, less so on elytra, not distinctly punctate; pubescence fine, short, subdecumbent, mixed with some slightly longer hairs, not forming sericeous patterns in any light. *Head* about 3/5 width prothorax; eyes large and prominent; front slightly concave at sides, faintly convex at middle; clypeus very wide and short, free at ends; labrum distinctly narrower; antennæ (last 5 joints missing) slightly finer and with slightly shorter joints than in *gracilis;* maxillary palpi shorter, finer, and with more oval apical joint. *Prothorax* transverse, about twice as wide

as long, strongly narrowed anteriorly from the acute basal angles; sides not margined, not explanate, slightly arcuate basally, more so anteriorly where rounded into front margin; latter arcuate, almost lobed, at middle; base lobed before scutellum, broadly emarginate at sides; disk rather irregularly convex but without distinct impressions. *Elytra* ample, together 1/3 wider than prothorax, formed as in *gracilis* but surface even less distinctly impressed. Abdomen (♀) with 6 ventral segments, 1st and 2nd not emarginate at middle. Mesosternum (♀) broader and less acutely impressed between middle coxæ than in *gracilis* (♂). Front and middle tarsi (♀) slender, about as in Psephenus, without sexual papillæ. Length not quite 4; width not quite 2 mm.

Cuba: holotype ♀ (M. C. Z. no. 21,786) unique from Soledad, near Cienfuegos, Santa Clara, Nov. 2, 1926, taken by myself. I do not remember the circumstances of capture.

Of the numerous characters which distinguish this species from *gracilis* as described, the different form of the prothorax (not subparallel near base in *cubanus*) and the different color and more regular pubescence may be presumed to be specific characters. The more densely roughened pronotum, narrower labrum, and entire 1st and 2nd ventral segments of *cubanus* may prove to be either specific or sexual differences, probably the latter. The shorter, slightly differently formed antennæ and palpi, the fewer ventral segments, more widely separated middle coxæ, and much smaller basal joint of front and middle tarsi, without papillæ, are, by analogy with Psephenus, strictly sexual characters and are so treated in my generic description of Pheneps.

Psephenops Grouvelle

(*Xexanchorinus* Grouvelle)

Notes from the Leyden Museum 20, 1898, pp. 44 & 45.

The gentoype of Psephenops is *P. smithi* Grouv. All of the types of this species were ♂ ♂. Champion (Trans. Ent. Soc. London 1913, p. 63, Pl. 3, figs. 2 & 2a) believed he had a ♀ Psephenops with dilated tarsi and 6 ventral segments. However, Mr. K. G. Blair has kindly examined

Champion's specimen for me and writes that he thinks it is undoubtedly a ♂, with apical abdominal segments and mesosternum between the coxæ formed as in ♂ ♂ of allied genera. Actually the ♀ of Psephenops, as shown by my *P. haitianus* (below), has slender tarsi and differs from the ♂ rather strikingly in its larger size and differently formed prothorax. It happens that there is an insect, *Xexanchorinus latus* Grouv., described from the exact locality of one of the types of *Psephenops smithi*, which differs from the latter about as my ♀ *Psephenops haitianus* differs from the ♂. Mr. Blair has compared *Xexanchorinus latus* with *Psephenops smithi* (types of both in British Museum) and writes that the antennæ of the two are similarly constructed and the elytral sculpture much the same. Judging from the sketches in Mr. Blair's letter, the dimorphism of the prothorax is about as great as in the Haitian species, and I am convinced that *Psephenops smithi* is the ♂ and *Xexanchorinus latus* the ♀ of one species. The former name has page priority as to both genus and species.

In accordance with these conclusions, and taking into account the peculiar heteromerous structure of the ♂ tarsi in *P. haitianus*, the secondary sexual characters of Psephenops are these: ♂ smaller and narrower than ♀, with narrower and more rounded prothorax which is less explanate at the sides; mesosternum between middle coxæ very narrow in ♂, much broader in ♀; ♂ with 7, ♀ with 6 ventral segments conformed as usual in Psepheninæ; dimorphism of antennæ and palpi less than usual in subfamily; ♂ with first and second joints front and middle tarsi and *either* first and second *or* only first joint of hind tarsus dilated and conspicuously lobed below, with densely pubescent soles; ♀ with slender and simple tarsi. It will be noted that all of these secondary sexual characters are either foreshadowed or duplicated in Psephenus or Pheneps or both, and that sexual dimorphism of the prothorax occurs also in some species of Phanocerus.

3. *Psephenops smithi* Grouvelle ♂

(*Xexanchorinus latus* Grouvelle (♀))

L. c., pp. 45 & 46.

Grenada and St. Vincent. The type locality of *X. latus* is

Chantilly Estate (windward side), Grenada, whence came at least one of the types of *P. smithi.* Mr. Blair writes that the hind tarsus of the ♂ has two dilated and lobed joints, like the front and middle tarsi.

Psephenops maculicollis n. sp. (Pl. III, fig. 1)

Not West Indian, but described here because it is the only typical Psephenops I myself have had for comparison with the new West Indian species.

Male only. Psephenus-like, rather depressed; brown, head black; pronotum dull reddish testaceous, dusky across base, with large, round, shining, piceous mark at middle from apex to about 2/5 from base and extending in a fine line on carina nearly to base; each elytron with a short testaceous fascia from near humerus obliquely back and inward; dorsal surface with fine, short, close pubescence, relatively sparse on pronotum; head, middle of pronotum, and elytra especially near base, decreasingly distinctly, finely, and closely punctate; lower surface dark gray, appendages brown. *Head* about 4/7 width prothorax; eyes prominent; front transversely ridged between upper parts of eyes; clypeus broad and short; labrum much narrower; antennæ short, reaching to about basal angles of prothorax, 2 basal joints somewhat enlarged, 2nd slightly shorter than 1st or 3rd, outer joints progressively shorter to subapical (wider than long), apical slightly longer. *Prothorax* not quite 1¾ times wide as long, much narrowed anteriorly; sides straight anteriorly, strongly rounded before basal angles; latter right; anterior angles very obtusely rounded; base lobed at middle and emarginate at sides; apex slightly arcuate; lateral margins explanate basally; disk convex, slightly impressed near basal angles and each side near base in areas equidistant from each other and sides, strongly carinate at middle in basal 1/3. *Elytra* together about 3/10 wider than prothorax, somewhat shorter than abdomen, broadly, independently rounded apically; surface with usual indistinct stria-like impressions. Palpi, mesosternum, and apical segments of abdomen (dissected) as usual in ♂ Psepheninæ; 1st ventral slightly emarginate at middle; all

tarsi with 1st and especially 2nd joints elongate, lobed, and with hairy soles. Length 2½; width 1 1/3 mm.

Colombia: holotype ♂ (M. C. Z. no. 21,788) unique from Rio Frio, about 20 mi. south of Santa Marta, Prov. of Magdalena, Feb. 25, 1928, taken on a stone in the Rio Frio River.

Differs from *Psephenops smithi* Grouvelle and *Ps. grouvellei* Champion (*l. c.*) in color and in having the sides of the prothorax strongly rounded near the base. The posterior tarsi are like those of *grouvellei* as figured by Champion.

4. **Psephenops haitianus** n. sp. (Pl. III, figs. 2 & 3)

Psephenus-like, rather depressed; dark brown, bases of legs, parts of lower surface, and base of elytra pale, pale area extending back (vaguely) on each elytron in a triangle 1/3 of length; upper surface roughened, especially on pronotum of ♀, not distinctly punctate, with fine, short, uniform, subdecumbent pubescence. *Head* small, just over ½ (♂) or less than ½ (♀) width prothorax; eyes prominent; front faintly concave; clypeus wide, short, free at ends; labrum narrower; antennæ moderate, reaching well (♂) or slightly (♀) beyond basal angles of prothorax, first 2 joints rather stout, 2nd about ½ length 1st, 3rd ½ longer than 2nd, outer joints progressively slightly shorter. *Prothorax* transverse, over 2 (♂) to about 2½ (♀) times wide as long; much narrowed anteriorly; sides not margined, not explanate, slightly and evenly arcuate (♂) or sinuate before the posterior angles (♀); latter acute; anterior angles very obtuse; base broadly lobed before scutellum, emarginate at sides; apex nearly truncate; disk convex, faintly depressed before posterior angles, very obsoletely carinate at middle of base. *Elytra* ample, together about 1/3 (♂) to ½ (♀) wider than prothorax; sides nearly straight and slightly divergent basally, broadly rounded to the independently rounded apices; surface with faint, longitudinal, stria-like impressions, more distinct in ♀, in which alternate intervals are slightly elevated near suture. Length (♂ ♀) about 2½ & 3½; width 1 2/5 & 2 1/10 mm. (exact measurement difficult because of position of specimens).

In addition to the differences in size, proportion, and sculpture, there are the following secondary sexual characters: antennæ and palpi relatively a little more elongate in ♂, but not much modified otherwise; prothorax sexually dimorphic in form, also more rounded dorso-ventrally at sides in ♂, more angulate in ♀, especially anteriorly; mesosternum very compressed between coxæ in ♂, much less in ♀; abdomen with 7 ventrals in ♂, 6 (apical visible only by dissection) in ♀; first ventral rather strongly emarginate at middle in ♂, much less in ♀; ♂ with first and second joints front and middle tarsi but only first of hind tarsus dilated, lobed below at apex, and with pubescent soles; ♀ tarsi slender, as in Psephenus.

Haiti: holotype ♂ (M. C. Z. no. 21,787) from Tardieu, just north of Mt. La Hotte, about 3,000 ft., Oct. 14, 1934, taken at night on a stone in the river with *Pheneps gracilis;* allotype ♀ from a small brook a few miles northeast of Mt. La Hotte, about 3,000 ft., Oct. 12, taken by holding a net in the current below a leafy sapling which had fallen into the brook and which I combed out thoroughly. In spite of the differences between these specimens there are so many points of exact correspondence — in details of the pale mark on the elytra, for instance, and in the faint sub-basal carina of the prothorax — that I feel certain they are one species.

The form of the ♂ hind tarsus distinguishes this species from all other known Psephenops. Possibly the difference may eventually prove to be of generic value.

Subfamily Dryopinæ

5. *Hexanchorus caraibus* (Coquerel)

Rev. Mag. Zoöl. (ser. 2) 3, 1851, p. 601, Pl. 15, fig. 14 (Potamophilus).

Described from Martinique and Guadeloupe.

6. *Phanocerus congener* Grouvelle

Notes from Leyden Museum 20, 1898, p. 46.

Grenada: described from Balthazar (windward side). This species should be compared with *P. clavicornis* Shp. of Central and South America.

7. *Phanocerus hubbardi* Schaeffer

Journ. New York Ent. Soc. 19, 1911, p. 119.

Jamaica and Haiti: described from the former without more definite locality. I have before me one ♂ topotype (same data as type) borrowed from the United States National Museum and 12 ♂, 11 ♀ from the northeastern foothills of the Massif de la Hotte, Haiti, 2–4,000 ft., Oct. 10-24, 1934, taken on water weeds, stones, and logs at water level in various rivers and brooks. These specimens are much darker than the Jamaican one, perhaps because of their greater freshness, and have the elytra slightly more strongly punctate. They are not so punctate as in *Ph. clavicornis* Sharp from Devil's River, Texas (♂ ♀ ♀, det. Schaeffer, borrowed from U. S. N. M.), however. The females in the Haitian series have the prothorax slightly more elongate, with sides more sinuate, than the males, so that I had separated the sexes even before examining the genitalia. A somewhat similar sexual difference exists in *clavicornis*, but not in the following species. The ♂ genitalia of all these species seem to be indistinguishable.

8. **Phanocerus helmoides** n. sp. (Pl. III, fig. 4)

Subparallel, rather elongate, convex; piceous brown, with fine, short, close pubescence; appendages brown, tibiæ, tarsi, and antennal club darker. *Head* 2/3 width prothorax. *Prothorax* subquadrate, ¼ (more or less) wider than long, only slightly more narrowed in front than behind; sides slightly or moderately arcuate, straight or slightly sinuate before base and apex; posterior angles right, anterior slightly obtuse but moderately prominent; explanate side margins conspicuous in anterior 1/3; apex arcuate; base strongly, sinuately lobed before scutellum; disk convex, with fine median longitudinal line, fine puncture each side of middle before base, rather fine groove each side from base 1/6 from side forward and then outward to just behind apical angle. *Elytra* slightly wider than prothorax, strial punctures rather fine, especially apically, more as in *hubbardi* than *clavicornis*. Length 2.3–2.8 by 1.1–1.2 mm.

Haiti: holotype ♂ (M. C. Z. no. 21,789) and 6 ♂, 6 ♀ paratypes (pair in U. S. N. M.) from the northeastern

foothills of the Massif de la Hotte, southwestern peninsula, 2–4,000 ft., Oct. 10–24, 1934, taken in the same situations as the preceding.

The relatively weak convolutions of the prothorax differentiate this from *clavicornis, hubbardi,* and *congener,* and give it a slightly Helmis-like aspect.

9. *Lutrochus geniculatus* Chev.

Ann. Soc. Ent. France (ser. 4) 4, 1864, p. 406 (Lutochrus); Grouvelle, Bull., Soc. Ent. France 1896, p. 17.

Cuba and Haiti: described from the former without more definite locality. I have before me a specimen (over 4 mm. long) supposed to be from Cuba and one (3½ mm.) from the northeastern foothills of the Massif de la Hotte, Haiti, about 3,000 ft., Oct. 12, 1929. These specimens differ from *luteus* Lec. of the United States just as described in Grouvelle's key (*l. c.*). The Haitian specimen was secured from the same fallen sappling which yielded the allotype of *Psephenops haitianus.* Another specimen was seen at the crossing of the auto road and Rivière Glace a few miles away, but flew from the edge of my net before I could reach it.

10. *Throscinus schwarzii* Schaeffer

Journ., New York Ent. Soc. 12, 1904, p. 204.

Jamaica (and Texas): described from the latter, from Brownsville. I have specimens from Brazoria Co., Texas, and one from Kingston, Jamaica, Aug. 27–29, 1934, taken in vegetation in the edge of a small pond. The Kingston specimen is not quite so roughened above as the Texan ones, but agrees well otherwise.

11. **Throscinus æthiops** n. sp. (Pl. III, fig. 7)

Elongate oval, convex; rather shining black above, lower surface and appendages reddish except antennal club black; pubescence moderate, longer than in *schwarzi,* tending to mat as in *crotchi* Lec. *Head* with front pubescent, not very closely punctate, somewhat shining (when pubescence removed); antennæ with club 7-jointed (*i. e.* 5th joint stouter than 4th and distinctly triangular), 3rd joint somewhat longer than 4th. *Prothorax* just over ½ wider than long, much narrowed anteriorly practically from the base;

sides slightly, almost evenly arcuate; base and apex as usual; disk very convex, not distinctly impressed, inconspicuously punctate. Scutellum not distinctly punctate. *Elytra* about 1/8 wider than prothorax; sides subparallel basally, broadly rounded posteriorly to near apex, where strongly sinuate (as usual); disk relatively closely and coarsely punctate, secondary punctation very fine, scarcely detectable; surface rather shining. Lower surface dull and pubescent (as usual). Length between 2 1/5 & 2¼; width 1 mm.

Haiti: holotype (M. C. Z. no. 21,790) from Trou Caiman (a large fresh lake in the Cul-de-Sac about 25 km. northeast of Port-au-Prince), Nov. 15–20, 1934, in floating aquatic vegetation; 2 paratypes from vicinity Port-au-Prince, further data accidentally omitted.

As compared with *T. schwarzi, æthiops* is much more shining, with coarser primary and much finer and less obvious secondary elytral punctuation and longer and more matted pubescence. The antennæ are similar, with 7-jointed clubs, which distinguish the species from *crotchi* Lec. (type seen) and *politus* Casey (paratype seen, borrowed from the U. S. N. M.) of the United States, which have 6-jointed antennal clubs.

Pelonomus Er.

The following material constitutes an informal revision of all the species of this genus found north of South America.

Pelonomus obscurus obscurus Lec.

Proc. Acad. Philadelphia 6, 1852, p. 42; Horn, Trans. American Ent. Soc. 3, 1870, p. 31; Sharp, Biologia Cent.–Amer. 1, part 2, 1882, p. 122.

Not Antillean (Texas and probably neighboring regions): Leconte's types (examined by me) are from the "southern and western states." All are ♀ ♀ without more definite locality. They belong to the Texan form, of which we possess also 10 ♂, 10 ♀ labeled "Tex." This typical form is characterized by a relatively broad (but somewhat variable) prosternal fissure behind the eye and by having the claw joint of the ♂ front tarsus very broad, widest near the base.

12. *Pelonomus obscurus gracilipes* Chev. (Pl. III, fig. 10)
(*rufescens* Casey)

Ann. Soc. Ent. France (ser. 4) 4, 1864, p. 406; Casey, Coleop, Notices 5, 1894, p. 581.

Cuba (and Florida) : Chevrolat's type was from the former; Casey's, from the latter. We have specimens from Soledad, near Cienfuegos, Santa Clara, Cuba, Aug., Oct., and Nov., and from Florida (Brighton near Lake Okeechobee, and Homestead) ; the species occurs in aquatic vegetation in ponds and is sometimes very abundant at light. The subspecies *gracilipes* differs from typical *obscurus* only in the usually narrower prosternal fissure and more slender anterior ♂ claw joint, which is parallel or slightly narrowed basally. Some of my Florida specimens are strongly rufescent like Casey's types, but the majority, and all the Cuban ones, are colored like typical *obscurus*. There is some variation in the form of the scutellum.

Pelonomus obscurus, both subspecies, has striking secondary sexual characters, some of which were noted by Sharp (*l. c.*). The last 2 joints ♂ maxillary palpi are very elongate, the subapical a little over ½ as long as the apical (in ♀ shorter, with relatively shorter subapical) ; the claw joint ♂ front tarsus is broader than in the ♀; the ♂ middle tibiæ are bent in at apex; and ♂ 3rd and 4th ventral segments are shortened or telescoped so that apical segment is relatively large and usually bent down. These characters are absent in the other Pelonomus known to me, and make recognition of *obscurus* easy. Moreover the ♂ genitalia of the latter are unique in that the lateral lobes are notched inwardly to receive the apex of the middle lobe.

P. obscurus is, of course, recorded from Mexico and Guatemala (Sharp, *l. c.*) as well as from the regions given above, but I do not know which subspecies is in Central America.

13. *Pelonomus picipes* (Oliv.) (Pl. III, fig. 11)
(*palpalis* Sharp)

Ent. 3, 1795, 41 bis, p. 4, Pl. 1, fig. 2 a, b, c (Dryops) ; Latreille, Hist. Nat. 9, 1804, p. 226; Lacordaire, Gen. Coleop., 1855, Atl. Pl. 24, fig. 1; Coquerel, Rev. Mag. Zoöl. (2) 3, 1851, p. 602; Sharp, Biologia Cent.–Amer. 1, part 2, pp. 122 (1882) & 774 (1887).

Guadeloupe (and Panama): described by Olivier from the former; Sharp's types were from the latter. I have before me a single ♂ from Gourbeyre, Guadeloupe, borrowed from the American Museum, which agrees well enough with the original description and figure and with Lacordaire's figure, and also 4 (both sexes) from Vulcan de Chiriqui, Panama, from Biologia material.

This species is very similar to *obscurus*, but lacks the secondary sexual characters of that species and has relatively longer posterior tarsi, about as long as the tibiæ. The lateral lobes of the ♂ genitalia are not notched. Sharp's species cannot be separated either by external or genitalic characters.

14. *Pelonomus insularis* Grouv.

Notes from the Leyden Museum 18, 1896, p. 33.

Hispaniola: described from both Santo Domingo and Haiti. I found specimens in Haiti at Etang Lachaux, southwestern peninsula, under 1,000 ft.; Poste Terre Rouge, north of the Cul-de-Sac, 2,000 ft.; Mt. Trou d'Eau, near by, 4,000 ft.; swamps north of Dessalines, near sea level; Ennery, 1,000 ft.; all Sept. to Nov., 1934; and we have 2 specimens from Diquini, near Port-au-Prince, W. M. Mann. The species occurs in aquatic vegetation and waterlogged trash in ponds or slow streams, not in rapid water.

Readily known by the very coarse punctuation of prothorax and elytra and by the traces of submarginal channels of the prothorax. The ♂ genitalia are as in *picipes*.

Subfamily Helminæ

All known West Indian Helminæ belong to Helmis as Sharp and Grouvelle understood the genus[1]. Moreover, the West Indian species are relatively few and are evidently derived from few sources.

15. *Helmis simplex* Darl.

Psyche 34, 1927, p. 96

Cuba: described from Soledad, near Cienfuegos, Santa Clara. Additional specimens were taken in August, 1934.

[1]Musgrave, Proc. Ent. Soc. Washington 37, 1935, pp. 32—, has referred one West Indian species to Cyllœpus and has described a new genus for another.

16a. *Helmis cæsa minima* Darl.

Psyche 34, 1927, pp. 93 & 97; Musgrave, *l. c.*, p. 34 (Neoelmis)

Cuba, Jamaica, and Haiti: described from Soledad, near Cienfuegos, Cuba, where retaken in August, 1934. Occurs also in Jamaica (no definite locality) and Haiti, where I found it only in the southwestern peninsula, in the La Hotte region, in rivers and brooks from 1,000 to 4,000 ft., Oct. 10-24, 1934.

I think that the various geographical forms related to *Helmis cæsa* Lec. (*cf.* Musgrave, *l. c.*) are best considered as subspecies. I do not mean by this to question their validity, but to show their evident relationship as slightly modified forms of one original stock.

16b. *Helmis cæsa gracilis* (Musgrave)

L. c., p. 35 (Neoelmis).

Puerto Rico: described from Rio Cañas, Las Marias. We possess 2 paratypes, thanks to the generosity of Mr. Musgrave.

17. *Helmis filiformis* Darl.

(*jamaicensis* Darl.)

Psyche 34, 1927, pp. 94 & 97

Cuba and Jamaica: described from Soledad, near Cienfuegos, Cuba, and retaken in numbers in August, 1934. This larger series varies enough to show that the Jamaican form is probably synonymous.

18. *Helmis smithi* Grouv.

Notes fr. Leyden Mus. 20, 1898, p. 47; Darlington, Psyche 34, 1927, p. 96.

Grenada (and Trinidad): described from the former (Mount Gay Estate, leeward side). In addition to a specimen from Grenada received from the U. S. N. M., I have a good series from St. Augustine, Trinidad, April, 1929, taken by myself.

19. *Helmis danforthi* (Musgrave)

L. c., p. 33 (Cyllœpus)

Puerto Rico: described from Rio Cañas, Las Marias; there are 2 paratypes in the M. C. Z., received from Mr. Musgrave.

20. **Helmis haitiana** n. sp. (Pl. III, fig. 8)

Form average, parallel; dull black, lower surface and appendages brown, antennæ paler basally; pubescence very inconspicuous. *Head* dull, granular. *Prothorax* subquadrate, moderately narrowed in front, scarcely so behind, 1/5 or 1/6 wider than long; sides broadly and more or less evenly arcuate, margins faintly crenate; disk convex, with entire sinuate carinæ nearly paralleling sides, these carinæ well defined inwardly, not defined (continuous with disk) externally; median longitudinal groove obsolete anteriorly, faint at middle, defined by a pair of faint carinæ at base; surface of disk dull but not distinctly granular, finely and not very closely punctate. *Elytra* ¼ or 1/5 wider than prothorax; sides nearly parallel basally, broadly rounded near apex; apices not produced; each elytron with 2 moderate costæ externally, evanescent on declivity; 4th interval faintly raised on disk, with a row of minute shining granules each side; 3rd interval faintly more prominent at base than 2nd or 4th; 4 discal striæ fine but distinct, indistinctly punctate; surface of disk dull but without distinct granules except on 4th interval and less distinctly on costæ (rarely a few on base of 3rd interval). Lower surface with scattered granules less obvious than usual; prosternal process about ½ width of mesosternum between middle coxæ; prosternum carinate before front coxæ; abdomen nearly uniformly granular-alutaceous, not obviously silky; 1st ventral not longitudinally carinate behind coxæ. Length 2 1/6–2 2/5; width 1 mm.

Haiti: holotype (M. C. Z. no. 21,793) and 17 paratypes (1 in U. S. N. M.) from the northeastern foothills of the Massif de la Hotte, southwestern peninsula, 2–4,000 ft., Oct. 10–24, 1934.

Differs from *danforthi* not only in larger size, but in less

granulate, more distinctly punctate pronotum, less distinctly sulcate at middle, and usually in lacking distinct shining granules on base of elytra inside 3rd stria [in *danforthi* there are such granules in increasing numbers on the bases of the 1st (few), 2nd, and (much more conspicuous) 3rd intervals.]

21. *Helmis quadrata* Darl.

Psyche 34, 1927, p. 95.

Cuba: described from Soledad, near Cienfuegos, where it was retaken in August, 1934.

22. **Helmis lahottensis** n. sp. (Pl. III, fig. 9)

Form about average, subparallel, but distinctly more gibbous than usual; dull black, appendages (except tarsi and bases of antennæ) not much paler; pubescence inconspicuous. *Head* dull, granular. *Prothorax* moderately narrowed anteriorly, slightly posteriorly, 1/5 or 1/6 wider than long; sides *either* evenly and slightly arcuate *or* subangulate at basal 2/5, slightly or not sinuate before basal angles; margins crenate; disk convex, with strong, entire carinæ paralleling side margins, said carinæ defined both inwardly and (less distinctly) externally; median sulcus obsolete anteriorily, very deep at middle, sides of sulcus elevated and continued to base where fused to form single strong carina impressed along crest; surface of disk dull, finely granular, not distinctly punctate. *Elytra* about ¼ wider than prothorax; sides slightly arcuate anteriorly, more posteriorly; apices not produced; each elytron with 2 moderate carinæ externally, evanescent on declivity; 3rd interval prominent basally; 4 discal striæ slightly impressed, finely and not closely punctate; intervals slightly irregular; some inconspicuous shining granules at base especially on 3rd and 4th intervals. Lower surface with small scattered granules; prosternum not distinctly carinate before coxæ; prosternal process about ½ width mesosternum between middle coxæ; abdomen evenly granular-alutaceous, not distinctly silky, basal segment not carinate behind coxæ. Length 2¼ (more or less); width 1 mm.

Haiti: holotype (M. C. Z. no. 21,794) and 10 paratypes

(1 in U. S. N. M.) from the northeastern foothills of the Massif de la Hotte, 2–4,000 ft., Oct. 10–24, 1934. Like all the other West Indian Helmis I have taken, this is found in stony and especially gravelly places in swiftly running brooks and rivers.

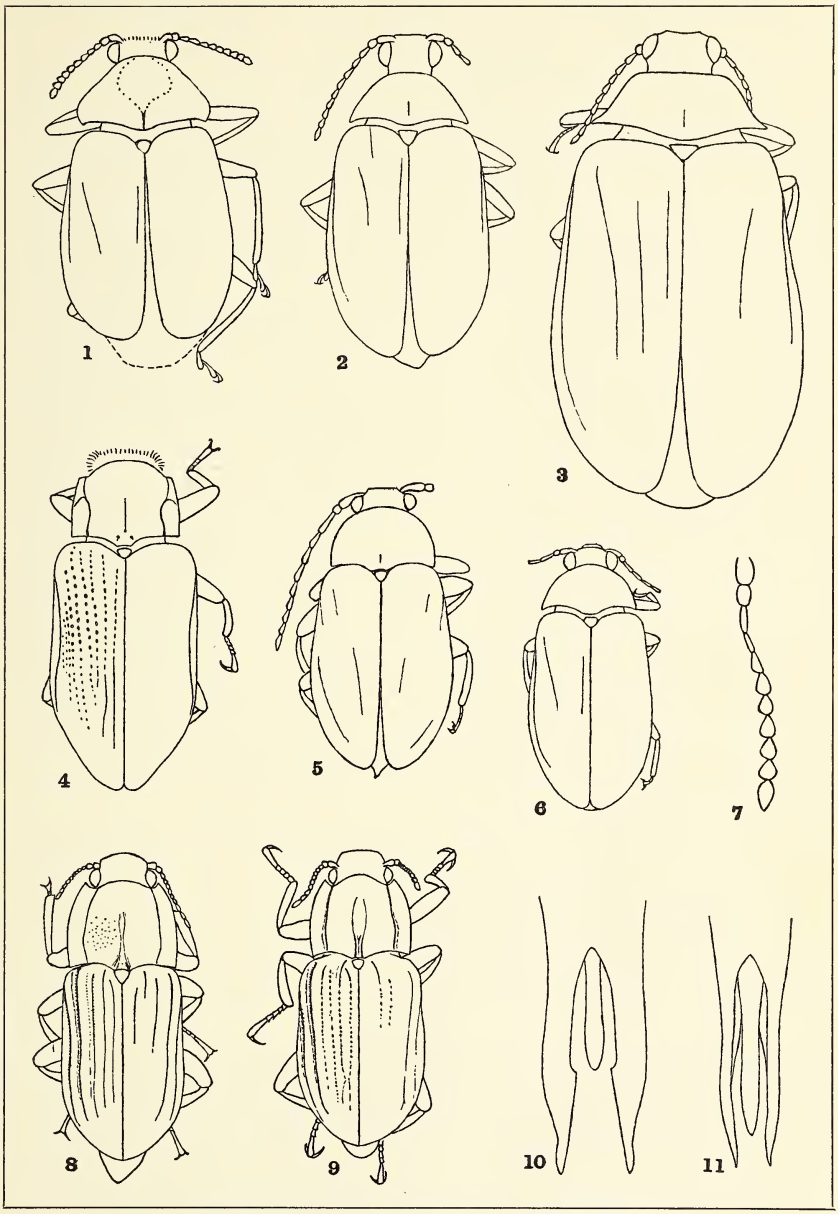
Differs from *quadrata* and its allies in being black, with coarser sculpture and differently carinate base of pronotum.

Explanation of Plate III

(All figures from camera-lucida outlines)

1. *Psephenops maculicollis* n. sp. (♂, holotype) × about 17.
2. *Psephenops haitianus* n. sp. (♂, holotype) × about 17.
3. *Psephenops haitianus* (♀, allotype) × about 17.
4. *Phanocerus helmoides* n. sp. (♀, paratype) × about 17.
5. *Pheneps gracilis* n. gen. & sp. (♂, paratype) × about 9.
6. *Pheneps cubanus* n. sp. (♀, holotype) × about 9.
7. *Throscinus æthiops* n. sp. (antenna of paratype).
8. *Helmis haitiana* n. sp. (paratype) × about 17.
9. *Helmis lahottensis* n. sp. (paratype) × about 17.
10. *Pelonomus obscurus gracilipes* Chev. (genitalia of ♂ from Soledad, near Cienfugos, Cuba).
11. *Pelonomus picipes* (Oliv.) (genitalia of ♂ from Gourbeyre, Guadeloupe).

Psyche, 1936 Vol. 43, Plate III.



Darlington — West Indian Dryopidæ.

PERILAMPUS, A SECONDARY PARASITE ON SARCOPHAGIDS AND TACHINIDS PARASITIC ON KATYDIDS AND LONG-HORNED GRASSHOPPERS

Ford[1] reports finding a planidium of Perilampus attached to a long-horned grasshopper, *Conocephalus fasciatus*. She considers it quite improbable that Conocephalus is the true host of the Perilampus, and that quite likely the planidium is a secondary parasite of some parasite of Conocephalus, because Perilampus has been reared as a secondary parasite from several species of Sarcophagids, though not from Sarcophagids on long-horned grasshoppers.[2, 3]

I have reared a Perilampus n. sp.[4] from one of three puparia collected from the cell of the digger wasp, *Ammobia pennsylvanica* which uses katydids, *Microcentrum rhombifolium* (*M. laurifolium*) for provisioning her cells. The other two puparia yielded a Brachymeria n. sp., and a Sarcophagid fly. The fly was in too poor a condition to allow of identification beyond Sarcophagidæ. The puparia, which were all identical, in structure, were new and as yet unidentified, making it impossible to use them as a means of identifying the fly. The find at least establishes the fact that Perilampus is a secondary parasite on a Sarcophagid parasitic on katydids.

From a collection of over fifty puparia of the Tachinid, *Senotainia trilineata* (V. d. W.) found in the cells of the same digger wasp, I reared 2 specimen of *Perilampus hyalinus* (Say). This establishes the fact that Perilampus is a secondary parasite on *Senotainia trilineata* parasitic on katydids. I have also reared, however, *S. trilineata* from

1. N. Ford, Canad. Ent., 54:199-204, 1922.
2. H. S. Smith, U S Dept Agr, Bur Ent, Tech Ser 19 (4):33-69, 1912.
3. E. O. G. Kelly, Jour. Agric. Res., U. S. Dept. Agr., 2:435-445, 1914.
4. Identifications were made by the staff of the Bur. Ent. and Plant Quar., U. S. Dept. Agr. as follows: Orthoptera, A. N. Caudell; Perilamphus, A. B. Gahan; Sarcophagids, J. M. Aldrich and C. T. Greene.

puparia found in the cells of the digger wasp *Ammobia ichneumonea* which provisions her nest with long-horned grasshoppers of the species *Neoconocephalus ensiger* (*Conocephalus ensiger*) and *Conocephalus attenuatum* (*Xiphidium attenuatum*). This confirms the opinion of Ford that the planidium found in *Conocephalus fasciatus* is a secondary parasite of a Tachinid parasitic on long-horned grasshoppers, in this case *Senotainia trilineata.*

John A. Frisch, S. J.

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PSYCHE

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NEW SPECIES OF SOUTHERN SPIDERS

By Elizabeth B. Bryant

Museum of Comparative Zoölogy

Cambridge, Mass.

During the winter and spring of 1935 a student at Southern Methodist University collected spiders throughout Dallas County, Texas. It is a section of the country from which little is known of the spider fauna. Among them were five new species and the male of a species known only from the type from Okefenokee Swamp, Georgia. From a small collection from Florida two species were found to be new and from the Florida Keys was found a male of a Cuban species known only from the female. Many species of spiders have been found to be common to Florida and Texas.

OECOBIIDAE

Oecobius texanus sp. nov.

Fig. 8, a, b, c, d, e

Female. Length, 2.5 mm.; ceph., 0.7 mm.; abd., 1.6 mm.; width of ceph. 0.8 mm.

Cephalothorax yellowish white with a dark margin and median area from eyes to posterior margin shaded with dark gray, black about eyes, broader than long, thoracic groove long and lightly impressed, clypeus protruding and shaded with gray; eyes closely grouped on a distinct elevation which falls away on all sides, anterior row procurved, a.m.e. largest of eight, round and dark, separated by more than a diameter and almost touching a.l.e. which are half

the size, flat and white, posterior row about the same length, strongly procurved, p.l.e. little smaller than a.m.e., round and dark and almost touching a.m.e., p.m.e. flat, white and triangular, separated by their long diameter; quadrangle of median eyes slightly wider in front and as high as wide; clypeus protruding and longer than quadrangle with a few

Fig. 1. a, and b, left palpus; c, eyes (male); d, eyes (female); e, epigynum.

colorless hairs at margin and a pair of very long hairs projecting forward directly above a.m.e.; mandibles colorless, weak and covered with long hairs, many with globular tips, fang impossible to see; labium triangular, as high as wide at base; maxillæ pale with many hairs, curved and almost

surrounding labium, pedipalps colorless, long and parallel, extending forward with a single claw; sternum colorless, wider than long, margins with many short hairs; abdomen oval, two thirds as wide as long, base slightly bilobed, a dull tan thickly covered with irregular chalky white spots, entire abdomen sparsely covered with very long colorless hairs, venter paler with the same chalky white spots; legs colorless with no indication of dark rings, hairy with many bristles that can hardly be called spines, I and II femora with a double row of heavy bristles, calamistrum double, extending over little more than the basal half of IV metatarsus; spinnerets protruding, of the usual type; epigynum with a bilobed chitinized margin thinly fringed with long colorless hairs above a slightly darkened area with transverse wrinkles; above the chitinized margin are two widely separated darkened areas.

Male. Length, 2.0 mm.; ceph., 0.8 mm.; abd., 1.3 mm.; width of the cephalothorax 1.0 mm.

Cephalothorax, pale as in female but without the dark margin, eye elevation higher than in female so that clypeus is almost vertical; palpus long, femora parallel, patella and tibia about equal length, terminal joint brown and palpal organ dark brown, projecting from cymbium quite the length of the joint as figured.

Holotype ♂ Texas; Dallas, 17 March, 1935, (S. Jones).
Allotype ♀ Texas; Dallas, 28 March, 1935, (S. Jones).
Paratype ♂ Texas; Dallas, 14 June, 1935, (S. Jones).
Paratype ♀ Texas; Dallas, 13 May, 1935, (S. Jones).

This genus has been represented in the United States by *Oecobius parietalis* (Hentz) found in the southern states. Chamberlin and Ivie have made a revision of the American species of the family in Ann. Ent. Soc. Amer., 1935, 28, pp. 262-272, pls. 1-4. They have described a new species *Oecobius isolatus* from immature females found at Carmen Island, Gulf of California and Sycamore Creek, Arizona. This species has heavily annulated legs and a carapace blackish. The relative position of the eyes is not given.

As so many small spiders are carried by commerce, it was thought that there was a possibility that this species might be *Oecobius maculatus* Simon, the species found about

the Mediterranean. As there were no specimens of this species in the museum collection, drawings of the Texan species were sent to the Paris Museum and M. Berland kindly compared them with the two European species. It was found to be different from either.

AGELENIDAE

Tegenaria simplex sp. nov.

Fig. 9

Female. Length, ceph., 2.2 mm.; abd., 3.1 mm.

Cephalothorax light yellowish brown, cephalic portion high, outlined with a broad stripe of dusky gray which continues to the posterior margin, lateral margins with a narrow black line and fringed with long dark hairs directed forward, thoracic groove long; eyes cover little more than middle half of the head, anterior row slightly procurved, eyes equidistant, a.m.e. smallest of the eight, separated by less than a radius, posterior row little longer than anterior, eyes equidistant, p.m.e. largest of the eight, separated by a diameter, lateral eyes almost touching and subequal; quadrangle of median eyes narrower in front and higher than wide; clypeus more than a diameter of a.m.e.; mandibles vertical, long, front surface flat with many black bristles, fang groove oblique, superior margin with scopula of long hairs, four distinct teeth, inferior margin with four teeth, fang long; labium as high as wide, tip rebordered, lateral margins almost parallel and excavate at basal fourth; maxillæ twice as long as labium with sides parallel; sternum with broad lateral dark stripes broken by two pairs of light spots opposite I and II coxæ, as wide as long, sides almost parallel between I, II and III coxæ, tip continued in a slender point between IV coxæ; abdomen two-thirds as wide as long, pale yellow with the usual grayish marks, tip much darker, venter pale with a gray rectangle from fold to spinnerets, containing two pale poorly defined parallel stripes; spinnerets, superior pair with long basal joint, terminal joint about two-thirds as long, inferior pair shorter than basal joint of superior; legs long and slender, IV pair missing, pale, femora darker with faint gray rings;

epigynum dark reddish-brown, with margins heavily chitinized, openings small and round, widely separated leading by spiral tubes to sacs above.

Holotype ♀ Texas; Dallas, near Southern Methodist University, 5 April, 1935.

This species is marked like *Tegenaria cavicola* Banks, from Salt Petre Cave, Indiana. Unfortunately the type of this species is immature. The posterior row of eyes is not as strongly procurved as in *Tegenaria domestica* but the epigynum has the same broad lobe. It differs from *Tegenaria obscura* Banks, described from a single female by the different proportion in length of the joints of the spinnerets and position of eyes of posterior row.

LYCOSIDAE

Schizocosa perplexa sp. nov.

Fig. 2

Male. Length, 9.0 mm.; ceph., 5.0 mm.; abd., 4.0 mm.

Cephalothorax with light stripe from second eye row to posterior margin, with sides evenly converging from the posterior eyes so that width at posterior margin less than half the greatest width, covered with short white hairs, sides brown, thickly covered with short black hairs, no indications of submarginal light stripe, very dark about eyes; eyes anterior row shorter than second row, a.m.e. separated by little over a radius, larger than a.l.e. and separated from them by less than a radius, eyes of second row separated by about a diameter; mandibles dark brown, covered with long black hairs, vertical, superior margin of fang groove with three teeth, middle largest, inferior margin with three subequal teeth; labium higher than wide, lateral excavations at base about one third the length; maxillæ twice as high as labium; sternum and coxæ light; abdomen with light brown basal stripe which disappears about middle; in this the usual spear-mark can be traced outlined by black dots, sides black, entire abdomen thickly covered with long dark hairs and a few longer white hairs at base on light stripe; venter dark with a few scattered lighter spots and a narrow, median light stripe from fold to spinnerets; legs, I

left, II right missing, I leg darkest, others same color as light stripe of cephalothorax, I tibia thickly covered with short erect black hairs, metatarsus with dark hairs not as numerous, these black hairs not as long as diameter of joint and much shorter than in *Schizocosa ocreata* (Hentz), spines, I tibia, dorsal 0, ventral, 2-2-2, basal and median pairs not overlapping, 1 lateral, metatarsus, 2-2, 1 lateral, posterior pairs spiny, III and IV tibiæ with dorsal basal and median spines; palpus, same color as legs, not as long as cephalothorax, seen from above, patella little longer than tibia, tibia only slightly swollen, not as broad as long, a small dark dorsal cusp extending towards cymbium, palpal organ lacking horn, principal tenaculum about the middle, unequally bidentate, lesser tenaculum situated above the middle, bent at right angles and turned downwards, above and parallel with the distal half is another slightly smaller process.

Holotype ♂, Texas; Dallas, Garland Swimming Pool, 25 March 1935 (S. Jones).

This species is a little larger than *Schizocosa puebla* Chamb. from Albuquerque, New Mexico, and is easily separated by the darker first leg, and tibia of the palpus shorter than patella and very different palpus.

OXYOPIDAE

Oxyopes helius Chamberlin

Fig. 7

Ent. News, 1929, 40, p. 19, fig. 4.

Male. Length, 4.0 mm.; ceph., 2.0 mm.; abd., 4.0 mm.

Cephalothorax with median light stripe starting from p.l.e., constricted to half that width at thoracic groove, suddenly widening and narrowed at posterior margin to same width as thoracic groove, dark lateral stripes about the same width as median light stripe with irregular margins on each side and extending below eyes on clypeus, sides light yellow with patches of white scales, thoracic groove long and faintly impressed; eyes, anterior row strongly recurved, a.m.e. smallest of eight, separated by a little more than a diameter and from a.l.e. by a diameter, a.l.e.

separated by almost two diameters and subequal with eyes of posterior row, slightly nearer a.m.e. than to p.l.e., posterior row of eyes strongly procurved, longer than anterior row, subequal and equidistant; quadrangle of median eyes much narrower in front, quadrangle of a.l.e. and p.m.e. of same width in front as behind and slightly wider than high; clypeus, very dark, showing no trace of vertical lines, three quarters as high as quadrangle of median eyes; mandibles small and dark, front surface light brown with a broad dark blotch, fang and fang groove short; sternum triangular, light yellow, margins heavily shaded in dark gray; coxæ light with dark margins; abdomen dark with no definite pattern, venter very dark; legs, without the dark longitudinal lines found in *O. salticus*, femora and tibiæ shaded with gray, very dark in ventral surface; palpus very dark, cymbium thickly covered with short black hairs and without the conspicuous conical dorsal prominence found in *O. salticus;* patella seen from above longer than tibia, as long as broad with several strong, dark apophyses on ventral side and a hammer shaped light lateral apophysis, tibia with a single enlargement at tip on ventral side which probably interlocks with a process on the patella; palpal organ of the usual type and completely filling the cavity.

Allotype ♂ Texas; Kaufman, 3 miles E. of Parson's Slough, 13 May 1935, (S. Jones).

The holotype was described from a female from Okefenokee Swamp, Georgia. Both male and female were taken at Parson's Slough, Texas. The male differs from any species found in North America and Mexico by the processes on the patella, as all known species have the processes on the tibia and patella smooth. Simon states that *O. lepidus* Blackw. (*similaris* Stol.) has a process on the patella.

DRASSIDAE

Nodocion agilis sp. nov.

Fig. 3

Male. Length, 5.0 mm.; ceph., 2.5 mm.; abd., 2.8 mm. Cephalothorax, a golden brown, smooth and shining with

a few hairs on posterior half, low, much narrowed in front, sides evenly rounded, thoracic groove short but distinct, radical striæ indistinct; eyes closely grouped covering two thirds of the head, anterior row weakly procurved, a.m.e. smallest of eight, separated by a little less than diameter and almost touching the flat and much larger a.l.e., posterior row same length as anterior, slightly procurved, p.m.e. angular, about the same size as p.l.e., separated by less than short diameter and from p.l.e. by even less, p.l.e. slightly smaller than a.l.e. and separated from them by less than diameter of the latter; quadrangle of median eyes narrower behind and higher than wide; clypeus little wider than diameter of a.m.e.; mandibles brown, vertical, median half thickly covered with short black bristles directed inward so as to form a thick brush, fang groove short, no teeth on either margin, fang weak; labium, narrower than high, sides almost parallel, palpi inserted beyond the middle of the maxillæ, tips inclined over labium; sternum bright yellow with a few stiff black bristles about the margin, three-quarters as wide as long, IV coxæ separated by less than half a diameter, I coxæ longer than IV, all coxæ can be seen from dorsal side beyond cephalothorax; abdomen a dull gray thickly covered with short stiff hairs, longer at base, venter lighter, inferior spinnerets separated by more than a diameter; legs, IV right leg missing, I leg longest, femur enlarged and flattened laterally, spines, I and II, femur, 1-1, dorsal, patella, tibia and metatarsus, 0, III and IV, femur, 1-1 dorsal, patella, tibia, dorsal O, several lateral and ventral not in pairs; palpus about as long as cephalothorax, febur longer than patella + tibia, tibia two-thirds as long as patella, tibial spur almost as long as joint, longer than diameter, pressed close to cymbium two thirds length and then bent outward, tip truncate, palpal organ completely filling cavity, embolus arising from near the tip making a sharp turn backwards and ending in a slender tip on the cymbium, on the opposite margin about the middle is a short black spur or spine parallel to the plane of the cavity.

Holotype ♂ Texas; Dallas, house on Oak Cliff, 15 May, 1935, (S. Jones).

The genus was based on a female from California. Chamberlin described one male that has a similar palpal organ but differs from the Texas species by the proportion of the joints of the palpus and the much longer tibial spur.

Drassyllus pullus sp. nov.

Fig. 4, 5

Male. Length, 5.1 mm.; ceph., 2.2 mm.; abd., 3.0 mm.

Cephalothorax dark brown with no light area, thoracic groove short but distinct, sides evenly rounded, front margin about same width as posterior; eyes covering middle half of head, anterior row straight, a.m.e. smallest of eight, separated by less than a diameter and from a.l.e. by less than a radius, a.l.e. largest of eight, posterior row a little longer than anterior row, straight, p.m.e. little smaller than a.l.e. round, separated by a diameter and from p.l.e. by less; quadrangle of median eyes slightly narrower in front and higher than wide; clypeus less than diameter of a.m.e.; mandibles dark brown, vertical, median margin covered with long bristles, fang groove slightly oblique, superior margin with numerous stiff bristles and two subequal teeth, inferior margin with three small teeth, fang stout at base and evenly curved; labium higher than wide, lateral margin excavate at basal third then sides slightly inclined towards tip; maxillæ once and a half times as high as labium; palpi inserted very near the tip; maxillæ distinctly impressed; sternum brown, two-thirds as wide as long, ending in a blunt point in front of IV coxæ, sides with numerous long bristles; abdomen oval, a dark gray, thinly covered with long hairs, basal scutum very distinct extending one third length of abdomen, venter pale, with a scutum separate from dorsal and extending from pedicle to fold; inferior spinnerets separated by more than a diameter; legs, I pair, and II right missing, dark with many long hairs and bristles, spines, II tibia, O spines ventral or lateral, metatarsus, 2 basal, rather weak, IV tibia, O spines dorsal but a lateral pair; palpus not as long as cephalothorax, seen from above patella longer than tibia, tibia

longer than wide, tibial apophysis longer than joint and extends one half length of cymbium, slender and smooth, embolus, short, starting from near the tip, making an abrupt turn soon after its origin, on opposite side of tip a slender black spine which extends slightly outside on cymbium, seen from the side between the embolus and the black spine are two leaf-like pieces with dark margins which cover the parts at the tip like a veil; at base of the organ is a dark round knob.

Holotype 1 ♂ Florida; Coral Gables, 17 June, 1935 (O. C. Webb).

Herpyllus faxoni sp. nov.

Fig. 6

Female. Length, exclusive of spinnerets, 7.5 mm.; ceph., 3.5 mm.; abd., 4.0 mm.; width of abd., 2.6 mm.

Cephalothorax golden brown, covered with fine white hairs and long scattered black hairs, widest between second and third pair of legs, much narrowed anteriorly, gently rounded, thoracic groove distinct; eyes, anterior row slightly recurved, a.m.e. largest of the eight, separated by a radius and almost touching a.l.e., posterior row procurved so that anterior margin of p.m.e. and middle of p.l.e. form a straight line, p.m.e. slightly angulate rather than oval, separated by a little more than their long diameter and by a little less from p.l.e., lateral eyes subequal and separated by less than a diameter; quadrangle of median eyes wider in front and slightly higher than wide; clypeus about one-half diameter of a.m.e.; mandibles vertical, cone shaped, brown covered with long black hairs, fang groove short, inferior margin with no teeth, superior margin with very small nodules, fang short; labium almost twice as high as wide, lateral margins at basal third slightly excavate; maxillæ not twice as high as labium, only slightly impressed, slightly inclined over labium, upper margins rounded; sternum oval, slightly narrowed between first coxæ, lateral margins slightly emarginate, tip obtusely pointed in front of fourth coxæ; abdomen dark gray with a median light stripe, wide at base, sides converging and almost meeting at middle and

continuing on posterior half as a much narrower spot that does not reach tip; venter light gray; legs, left III missing, 4-1-2-3, same color as cephalothorax, thinly covered with fine dark hairs, anterior metatarsi and tarsi with dense scopula, spines, I tibia, I-I-I, basal, median and apical, left tibia with basal spine missing, metatarsus, 2 basal, II tibia, I-I, median and apical, spines more numerous on posterior pairs, III tibia, dorsal, I basal spine, IV tibia dorsal, O spine; epigynum, the openings a short distance above the fold, connected with fold by a heavily chitinized groove, above are the round receptacles separated by half a diameter.

Holotype ♀ Florida; Sebastian, February, 1932, (G. Nelson).

This species differs from others found in Florida by the procurved row of posterior eyes, quadrangles of median eyes wider in front, and the lack of dorsal spine on the IV tibia. *Herpyllus cratus* Chamb., also from Florida, is immature and so is difficult to place. It is much darker in color, possibly due to the length of time it has been in alcohol, it is larger, the spines on the anterior tibiæ are not paired, the epigynum while showing the chitinized grooves will be evidently much longer, but it has a dorsal spine at the base of III tibia and none at the base of IV tibia.

CLUBIONIDAE

Clubiona transversa sp. nov.

Fig. 8

Female. Length, 8.6 mm.; ceph., 3.1 mm.; abd., 5.5 mm.

Cephalothorax pale yellow shading to brown near the eyes, sides almost parallel, front broad, thoracic groove distinct; eyes, anterior row straight, eyes subequal and equidistant, separated by less than a diameter, posterior row longer than anterior, covering almost entire width of head, straight or very slightly procurved, eyes subequal p.m.e. slightly nearer p.l.e. than to each other; quadrangle of median eyes narrower in front and wider behind than high; clypeus less than a radius of a.m.e.; mandibles very

dark brown, swollen at base, long, boss small, fang groove slightly oblique, superior margin with one large tooth, preceded by several small teeth and followed by one medium sized tooth, inferior margin with two teeth, fang, stout and evenly curved; labium twice as high as wide, lateral margins excavate on basal third, tip slightly narrower than base; maxillæ twice as high as labium, tips slightly dilate; palpus inserted at basal third; sternum twice as long as wide, width of labium in front and pointed in front of IV coxæ; abdomen oval, twice as long as wide, pointed above spinnerets, a dirty white shading to a light brown at tip, venter pale with a faint dusky median line; legs, 4-1-2-3, right I and IV missing, pale dense scopula on anterior tarsi and metatarsi, faint scopula on distal half of anterior tibiæ, spines, I and II tibiæ, 2-2, long ventral, O lateral, metatarsi 2, basal, ventral, O lateral; epigynum wider than high, convex, with a dark narrow median septum which starts from a heavily chitinized ridge and curls under the fold midway in the clear area each side, starting from the median septum is a narrow dark transverse bar which does not reach outer margin, openings probably near the ends of the chitinized ridge.

Holotype ♀ Texas; Dallas, White Rock Lake, 25 March, 1935. (S. Jones).

Wulfila immaculata Banks

Fig. 1

Bull. Amer. Mus. Nat. Hist., 1914, 33, p. 640, pl. 43, fig. 7.

Male. Length, 4.0 mm.; ceph., 1.5 mm.; abd., 2.2 mm. (measurement of length is without mandibles and spinnerets).

Cephalothorax almost white, sparsely covered with colorless hairs, not very high, sides evenly rounded, thoracic groove a depression rather than a groove, at anterior outer corner is a darkened vertical cusp or spur similar to figure of *W. tropica* Petrunkevitch Trans. Conn. Acad., 1930, 31, p. 68, figs. 56 to 60; eyes, very little black pigment about eyes, anterior row slightly recurved, a.m.e. smallest of eight, separated by a scant diameter and from a.l.e. by

more than a diameter, posterior row longer than anterior, procurved, eyes equidistant and subequal; quadrangle of median eyes narrower in front and as high as wide; clypeus one and a half diameters of a.m.e.; mandibles three-fifths as long as cephalothorax antenuate, outer margins parallel, fang groove long, oblique, superior margin with a distinct carina from base of fang ending in five teeth which extend on median margin, inferior margin illy defined and impossible to see any teeth; Petrunkevitch in redescribing the female *W. immaculata* states, Trans. Conn. Acad., 1930, 31, p. 85, that the mandible when stained and mounted on a slide shows a row of nine small teeth, very scant scopula on superior margin only, fang long and sinuous; labium higher than wide; maxillæ twice as long as labium, tips slightly widened, palpi inserted at basal third; sternum flat, oval, IV coxæ separated by a diameter; abdomen oval, more than twice as long as wide, colorless, spinnerets extending beyond tip, openings of tracheal spirale about middle; legs, I pair much the longest, fem., 3.0 mm.; pat. + tib., 4.6 mm.; metat., 4.1 mm.; tar., 2.0 mm.=13.7 mm. Spines colorless, femur, 3 dorsal serial, tibia, 2-2, ventral, 2 lateral, metatarsus, 2, basal, 2 lateral, spines more numerous on posterior legs; palpus, longer than cephalothorax, tibia longer than patella, but little over half as long a terminal joint, tibial apophysis a small abrupt cusp at right angles from the joint with three short spines on ventral side and several long bristles on exterior.

Allotype ♂ Florida; Bicknell's Hammock, 30 April, 1935 (Gribbins).

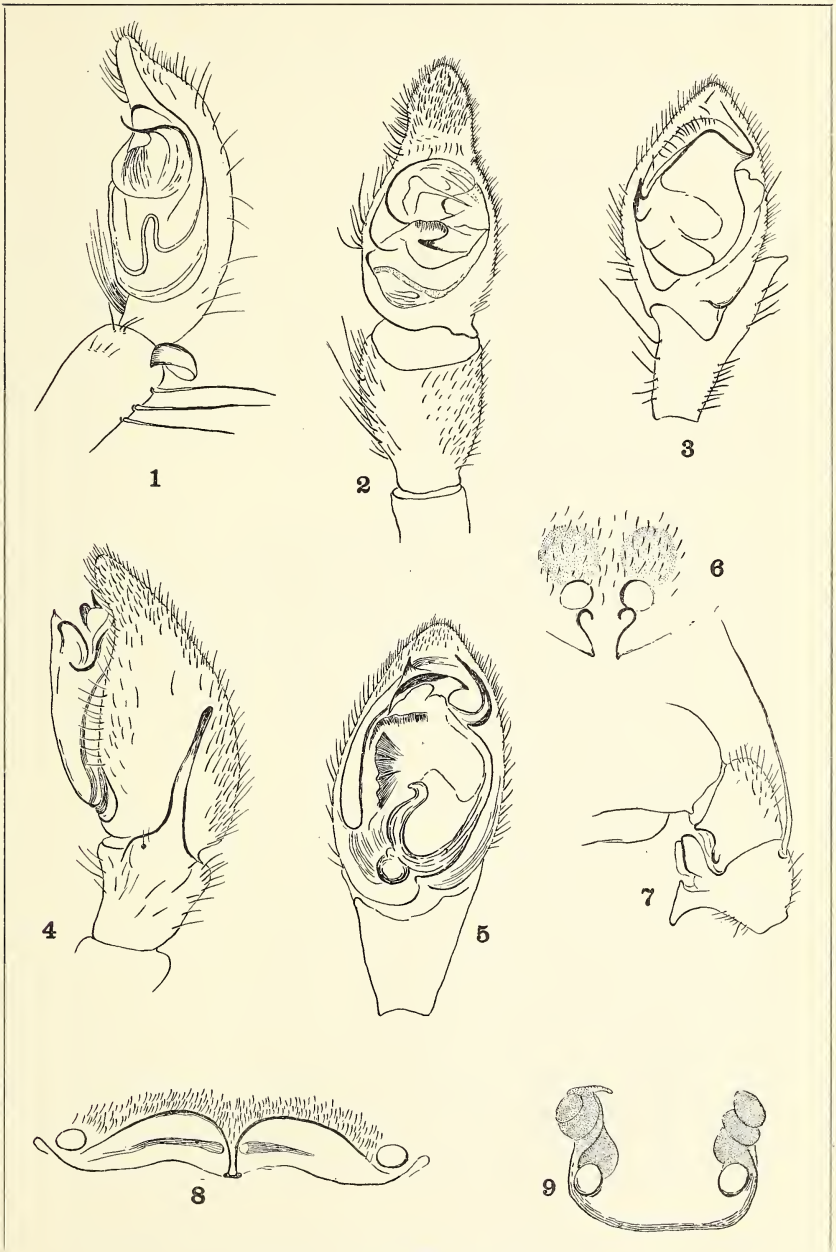
The type, a female from Vinales, Cuba, is in the American Museum of Natural History. It has been found since at Porto Rico and Mona. A female was taken at Siboney, Cuba, without the first pair of legs. Petrunkevitch gives a detailed description of the type female in Trans. Conn. Acad., 1930, p. 85, fig. 72. The male agrees with the female with the long first legs, the eyes, teeth on the mandibles and number of spines on the legs. The spines are difficult to see. It does not agree with the definition of the genus given by Petrunkevitch, 1930, p. 66, but probably

when both sexes of all species are known, the difference in the number of spines will be modified. The cusps on the outer corners of the cephalothorax are evidently a secondary sexual character.

EXPLANATION OF PLATE III

Fig. 1. *Wulfila immaculata* Banks
Fig. 2. *Schizocosa perplexa* sp. n.
Fig. 3. *Nodocion agilis* sp. n.
Fig. 4. *Drassyllus pullus* sp. n.
Fig. 5. *Drassyllus pullus* sp. n.
Fig. 6. *Herpyllus faxoni* sp. n.
Fig. 7. *Oxyopes helius* Chamb.
Fig. 8. *Clubiona transversa* sp. n.
Fig. 9. *Tegenaria simplex* sp. n.

Psyche, 1936 Vol. 43, Plate III



Bryant—New Southern Spiders

A NEW ŒDEMERID BEETLE FROM CUBA

By P. J. Darlington, Jr.
Museum of Comparative Zoölogy
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The following description of a new Cuban Oedemerid is published now so that the name will be available for use in a forthcoming paper on mimicry of the Lycid genus Thonalmus. Because of the present confusion among genera in the family Oedemeridæ, I have collected in a separate paragraph the characters which have led me to place the new species in the genus Copidita.

Copidita thonalmus n. sp.

Generic characters: Head not prolonged into a beak; eyes only shallowly emarginate behind insertions of antennæ; both mandibles bifid at apex; last segment maxillary palpi triangular but not broadly so; antennæ with segment 11 more or less divided; middle coxæ contiguous; front tibia with 2 spurs; penultimate segment of tarsi broadly lobed; tarsal claws angulate below but not toothed; ♂ 5th ventral segment not emarginate.

Specific characters: Body moderately stout for Copidita; color bright orange with apical ½ to ¾ of elytra dark blue or greenish blue, the line of demarcation of the colors somewhat irregular, the orange extending slightly toward apex at suture and margins, but not forming sutural and marginal stripes; eyes, antennæ, palpi, tips of mandibles, and legs black, except bases of femora orange; abdomen more or less dusky. Surface of head and pronotum slightly shining, although closely punctate except on very narrow poorly defined median stripe; elytra dull, closely punctate. Eyes not very prominent. Prothorax about one-tenth (by measurement) wider than long, subcordate, with base about

three-quarters as wide as widest part and sides slightly sinuate before basal angles, which are not prominent. Elytra one-quarter (♂) to one-half (♀) wider than prothorax. Length 6.5.-8.0; width 1.9-2.4 mm.

Holotype ♂ (M. C. Z. no. 22464) (sex determined by dissection) and 4 paratypes from Janorú (Camagüey Province), Cuba, May 27, 1931, "taken on weeds" by L. C. Scaramuzza; 1 paratype from about 3,000 ft. altitude near Buenos Aires, Trinidad Mts. (Santa Clara Province), Cuba, May 8-14, 1936, taken by myself on an unidentified flowering tree.

The coloration of this beautiful Oedemerid is unique, so far as I have been able to find by an examination of the descriptions of all known West Indian and many Central American species, and an examination of North American species in the Leconte Collection. The color at once distinguishes *thonalmus* from the commoner Cuban *Copidita testaceicollis* (Jac.-Duval) (de la Sagra's *Histoire . . . de Cuba,* [Vol. 7] *Animaux Articulés,* 1857, p. 158), which has similar generic characters but is smaller, black, with vaguely bluish or greenish elytra and yellowish prothorax. The only other Oedemerid recorded from Cuba, *Asclera latior* Pic (*Mélanges exot.-ent. fasc.* 40, 1923 p. 32), is not known to me, but is described as similar in color to *testaceicollis.*

THE PERSIUS GROUP OF THANAOS (LEPIDOPTERA, HESPERIIDAE)

By William T. M. Forbes,

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This group has been a standing problem for many years. On the one hand, the superficial and genitalic differences of the adults are so small that the late Dr. Skinner and various other workers were convinced that there was only a single variable species. On the other hand, the earliest rearings showed that there were two widely divergent foodplants (columbine and willow or poplar), associated with visible differences in appearance of the butterflies; and later work has added Baptisia as a third,—each belonging to a different and widely separated family of plants. This for the East; in Arizona we must add *afranius* Lintner, and California has a complex that only local rearing can straighten out. In this paper I am taking the *persius* group in its strictest sense, comprising only the forms with genitalia of identical plan: socii rather long, equal in size and spike-like (one more curved than the other); left valve with three strong lobes, the middle one longitudinal in general direction, right valve two-lobed, with a short tooth on the upper outer angle of the lower lobe, to represent the middle lobe of the left side. This definition will include the three eastern types, afranius, and California specimens identical in structure with persius and afranius, but will exclude the Californian *lilius* and *callidus*, also *pernigra* if rightly identified at the National Museum. *T. avinoffi* of Alaska probably is also included, but has not been examined structurally.

I use the name Thanaos for familiarity. Erynnis may be defended on the basis of the code, but has no effective use in this sense, and substantial use in another subfamily; so should be excluded by a conservanda ruling if the code continues to function.

The present paper is drawn up from the eastern point of

view. West of the Mississippi river there may be additional complications. There is a divergent looking form from Omaha, Nebraska (two specimens at hand) ; *afranius* shows some sign of complexity, that should be cleared up by more extensive rearing, and of the California material only that which could be placed in more eastern species has been analyzed. Lucilius and the Baptisia species appear to be absent from California, but there is a black species with the structure of *afranius* to complicate matters. True *persius* is more common in California than in the east, but has been generally mistaken there for *afranius*.

The crux of the confusion has been the current mistaking of the Baptisia species for *persius*, which has generally gone unrecognized, or been determined erroneously as *afranius*, —and back of this confusion is the fact that true *persius* is relatively scarce from the east in collections, and perhaps the slight miscoloring of Scudder's figure. Speaking generally Scudder, Holland and the U. S. National Museum had *persius* correctly identified, while Skinner, Lindsey and the Barnes collection had the Baptisia species standing as *persius*, with possibly a few scattered eastern specimens of true *persius*, while the main series of *persius* were western specimens and stood as *afranius*. The true *persius* has excellent genitalic characters, and east of the Rocky Mountains may be distinguished by its coating of long scattered white hairs on the disc of the forewing. In Arizona all the group become heavily covered with white, but in California I believe *persius* again is the only one with the white hairs.

Thanaos persius Scudder

1862. *Nisoniades persius* Scudder, Proc. Essex Inst. iii 170.

1870. *Nisoniades persius* Scudder & Burgess, Proc. Boston Soc. Nat. Hist. xiii, 286, fig. 1 (genitalia).

1889. *Thanaos persius* Scudder, Butt. E. N. A. ii, 1468-1476, pl. ix, fig. 1, xxxvi, fig. 1-3, etc. (colored figure perhaps contaminated with Baptisia species).

1872. *Nisoniades persius* Lintner, 23rd Rept. N. Y. State Cab. Nat. Hist. 165 (note), pl. vii, figs. 3, 4 (Ent. Cont. p. 33).

1898. *Thanaos persius* Holland, Butt. Book pl. xlviii, fig. 1, (a California specimen).

1921. *Thanaos persius*, race *afranius* Lindsey (approximately) Univ. Ia. Stud. ix (4), 52.[1]

1927. *Erynnis persius afranius* Comstock, Butt. Calif. 212 (in part), pl. lix, fig. 2 (not fig. 3).

1931. *Erynnis afranius* Lindsey, Bell & Williams, Denison Univ. Bull., Jour. Sci. Lab. xxvi, 62 (in part) (not *Nisoniades afranius* Lintner).

There is further bibliography in Scudd. '89, Lindsey '21 and '31, and Skinner Syn. Cat. No. Am. Rhopalocera, but the latter three must be used with caution on account of the confusion of species.

It would appear that Scudder had a pretty clear idea of this species, as shown by the type (whose genitalia I figure, fig. 5), the Scudder and Burgess figure of the genitalia, and the biological data and foodplants. But his figure shows too much brown, and may possibly have been contaminated by the Baptisia species. Holland figures it correctly from a California specimen[2], and the main series in the National Museum (representing Dyar's determination) is correct and pure; but Skinner failed to recognize it, most of his series being of the Baptisia species, which is far commoner in the east; and several later workers have followed his misidentification, apparently viewing the occasional eastern specimen as aberrant, and putting the western material in *afranius*.

Superficially *persius* can be instantly recognized in the east, and I believe in the Northwest and California, by the abundant hair on the base and disc of the fore wing, some of which is white, and the general smooth appearance, the pale spot over the end of the cell being gray when distinct. In Arizona the other species show the same pale hair, but can be distinguished by the genitalia. *Afranius* also differs as a rule in the paler outer margin of the fore wing, due to a large percent of white scales; on which the wedge-like

[1]This determination judged by the arrangement of the Barnes collection as deposited in the U. S. National Museum.

[2]The apparent transparent cell-spots are pin-holes.

black postmedial spots, and less defined submarginal and marginal ones contrast strongly. The pale fringe, emphasized by Lindsey, occurs in specimens of both types of genitalia, and is probably a dry climate modification of all the species.

The chief characters are: left valve with middle lobe much widened, separated from the upper lobe by less than its width, with a heavy keel on its inner face, extending about half way to the tip (present in a single aberrant or hybrid specimen of *afranius*); upper lobe with spinulation limited to its apical part; right valve with upper lobe massive, separated from lower by a narrow chink, its tip recurved into a massive, heavily spinulated hook, which invariably folds back on itself in the mounted valve, its outer lower edge not toothed, more or less lobed and hairy at the middle; the whole larger than in any *afranius* or *lucilius*, or most *baptisiæ*, being over 0.8 mm. long with few exceptions, and over 0.62 (5/8) mm. wide in all specimens seen. Lower lobe short and heavy, less than twice as long as upper lobe, its tip ending in a more or less distinct rounded thickening on inner side, and wholly without teeth. The whole structure, including the tegumen, is more massive than the other species. The broad middle lobe on the right side can be seen without dissection, but is set on obliquely and often seems narrower than it really is.

I have specimens before me from Bristol (fig. 1) and Johnston, R. I., New Haven, Conn., Crosby and Yapyank, N. Y., Eagle, Ala., and numerous western specimens, mostly from Col., Wyo., Alta. and Cal. The latter are generally mixed with *afranius*, but the massive genitalia will distinguish them; in fact some California specimens are more massive than the eastern ones. I have only seen spring dates from the east, though it flies in July in the Rocky Mountains, so I believe it is single brooded, in the spring where the climate permits.

In the remaining species the middle lobe of the right valve is slender, with a wide space between it and the upper; and its inner keel is weak and stops practically at its base; the upper lobe shows some tendency for the hair to extend down in a line to near the base of the middle lobe

(especially in *afranius*) ; the upper lobe of the right valve is smaller, and its lower outer edge is not lobed and is more or less distinctly toothed; the lower lobe is long and slender and toothed at the tip (the teeth weak or occasionally ab-

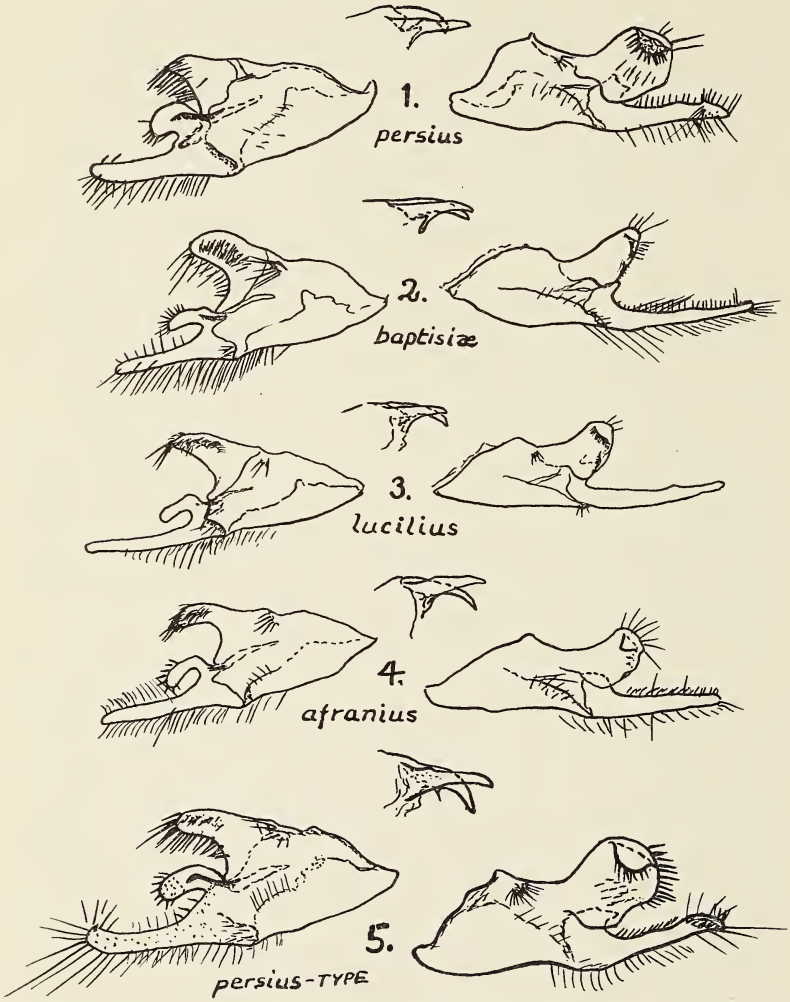

Fig. 1. Each figure shows the left valve on left, tegumen in side view in the center, and right valve at right. 1, *T. persius*, Bristol, R. I. 2, *T. baptisiæ*, type, Woods Hole, Mass.; 3, *T. lucilius*, Ithaca, N. Y.; 4, *T. afranius*, Ariz.; 5, *T. persius*, type, Mass.

sent in *afranius*). The hair on the fore wing is all dark or with two or three scattered white hairs in eastern specimens, and seems less dense as a whole; in Arizona it becomes more visible, but seems less than on *persius* from the same neighborhoods. In *afranius,* where there is more hair, the white scaling is also increased in even greater proportion.

Thanaos afranius Lintner

1878. *Nisoniades afranius* Lintner, 30th Rept. N. Y. Mus. Nat. Hist. 175.
1898. *Thanaos afranius* Holland, Butt. Book, pl. xlv fig. 5.
1921. *Thanaos persius,* race *afranius* Lindsey, Univ. Ia. Stud. ix (4), 52 (in part).
1927. *Erynnis afranius* Lindsey, Denison Univ. Bull. Jour. Sci. Lab. xxii, 109 (larva on lupine and discussion).
1927. *Erynnis persius afranius* Comstock, Butt. Calif. 212 (in part), pl. lix, fig. 3 (?, not fig. 2).
1931. *Erynnis afranius* Lindsey, Bell and Williams, Denison Univ. Bull., Jour. Sci. Lab. xxvi. 62 (in part).

This species is intermediate between the preceding and following, but may usually be distinguished from both by its pale gray outer part of the fore wing, with contrasting black markings (as seen by naked eye). In California there is a form with identical structure, however, that is mostly blackish, and should be looked into biologically.

Male genitalia intermediate between *persius* and the other two species, and more variable than either (suggesting possible origin by hybridization). Hair of upper left lobe usually in two distinct rows, both long, and converging to the upper notch, the upper row very dense in the area corresponding to the smaller hair patch of *persius*; sometimes the two rows confused by the presence of considerable hair in the intervening area; right valve more distinctive, similar to *lucilius,* but with the chitinous teeth weak, both on the edge of upper and tip of lower lobes, occasionally not visible on one or both; tip of upper lobe intermediate, almost invariably turning under in a mounted slide as in *persius,* but relatively small. Genitalia as a whole much

smaller than in *persius*, there being no overlap in size. The right upper lobe seems to vary a good deal in shape, with very little variation in size (unlike *lucilius*, whose average size is about the same).

Most of the specimens I have seen come from Arizona; there is one before me from Colorado (Oslar).

Thanaos lucilius Scudder and Burgess

1870. *Nisoniades lucilius* Scudder and Burgess, Proc. Boston Soc. Nat. Hist., xiii, 287, fig. 2 (male genitalia).
1872. *Nisoniades lucilius* Lintner, 23rd Rept. N. Y. State Lab. Nat. Hist. 162, pl. vii, figs. 1, 2 (Ent. Cont. p. 31).
1873. *Nisoniades lucilius* 24th Rept. N. Y. State Lab. Nat. Hist., 162, 164, 167 etc. (Larva on Aquilegia).
1889. *Thanaos lucilius* Scudder, Butt. E. N. A. ii, 1458-1467, pl. ix, fig. 4, xxxvi, figs. 4-6, etc.
1898. *Thanaos lucilius* Holland, Butt. Book, pl. xlviii, fig. 10.
1921. *Thanaos persius*, race *lucilius* Lindsey, Univ. Ia. Stud. ix (4) 52, (pl. ii, fig. 5; male genitalia probably of this, as *persius*).
1931. *Erynnis lucilius* Lindsey, Bell and Williams, Denison Univ. Bull. Jour. Sci. Lab. xxvi, 62 (pl. xiv. reprinted from preceding).

Bibliography under this name is generally correct, the foodplant serving to tie it down.

Genitalia essentially as in *baptisiæ*, but apparently on the average with the upper lobe of the right valve broader in proportion. Size much more variable than shape (unlike *afranius*) but generally a little smaller than *baptisiæ*, about in proportion to the size of the butterfly.

Superficially *lucilius* has a more purplish tint, the paler areas, especially the one beyond the cell, having even a rosy iridescence in a favorable light (mentioned by Lintner). The average size is smaller, generally under 30 mm. expanse. The blackish markings on the fore wing are apt to be a little narrower; for instance, the ante- and postmedial spots in the submedian area are generally shorter than their

distance apart. Scudder separates *lucilius* from *persius* as having "a large, somewhat distinct patch, paler than the ground color, between the cellular and subcostal vitreous spots of the fore wings." This character generally holds against true persius, but is shared by *baptisiæ*. There is very little white hair, if any, in eastern specimens.

Lucilius has been frequently reared, always from Columbine. It has two or three broods. I have examined unmistakeable specimens from as far as Nebraska, but its western extent must be verified by larval determinations. If there is a western strain it has been mixed *with afranius*.

Thanaos baptisiæ new species

1889. 'Not *Thanaos persius*' Scudder, Butt. E. N. A. ii 1473 (larva on Lespedeza, perhaps another species).

1921. *Thanaos persius* Lindsey, Univ. Ia. Stud. ix (4), 52 (in part, including generalities and perhaps figure of genitalia).

1931. *Erynnis persius* Lindsey, Bell and Williams, Denison Univ. Bull., Jour. Sci. Lab. xxvi, 62 (in part, perhaps figure of genitalia, but not discussion of larva).

Thanaos persius of most eastern collections, but not of Scudder).

Similar to *T. lucilius*, so close that a comparative description is in order. Average size slightly larger (mostly over 30 mm.). Ground a more yellow brown; in direct light a dull umber, in favorable light showing just a trace of the purple iridescence of *lucilius*. Pale areas produced mainly by a luteous ground (while in *lucilius* the ground is hardly paler than the dark areas, but there is a higher percent of white scales), but with some white scaling, especially toward costa. Iridescence somewhat less difficult than on dark areas, brassy, in some lights with a distinct greensh tint. In the type, a fully marked specimen, the pale areas are spots antemedially, medially and postmedially in fold, separated by wider dark bars, very faint flecks in cell, fairly complete post medial and subterminal fasciæ (including the submedian spots already mentioned), and much smaller

and paler preterminal spots; all these essentially as in *lucilius,* except as noted in color. Hind wing and under side like *lucilius.* Dark males show a blurring and lack of contrast of the paler and darker areas, both of which are umber brown. Rubbed specimens tend to develop an iridescence like that of *lucilius,* but lose the white scaling more completely. Female essentially like male (except lack of costal fold) but as usual paler, more mottled looking, and with a tendency for the paler areas to increase on the outer half of the wing.

Male genitalia (fig. 2) substantially identical with *T. lucilius.* Left valve with upper lobe widely divergent from middle lobe, the spinulation on inner surface forming a band extending about to base of lobe; middle lobe of even width, sharply curved ventrad, with a rudimentary keel on inner face running into its base. Lower lobe slender and somewhat tapering, separated by its width from middle lobe Tubercle at middle of costa with 6 or 8 hairs. Right valve with upper lobe tapering toward tip, not densely spined, the tip not recurved, but bearing on its inner face a sharp raised ridge which is clothed with very fine spinules and granules. A similar ridge along or very close to its outer edge, more granulose than spinulose, and connected with the first by a few granules on the face of the lobe. Middle lobe represented by a small sharp tooth overlying face of upper lobe; lower lobe slender, twice as long as upper lobe, widely divergent and tapering, with distinct terminal teeth. Uncus as usual; the left spine nearly straight and right spine sharply curved, more pointed than in *persius,* but substantially as in lucilius.

Type and paratypes from Woods Hole, Mass., July, Cornell Univ. type no. 1391. Allotype from Decatur, Ill., July, reared from Baptisia (in U. S. National Museum from Barnes coll.). The types were taken in close association with *Baptisia tinctoria,* though the females were not seen actually ovipositing. They hovered most persistently over tiny dwarf plants in the paths. I have also seen specimens that seem to be this from other points in New England, N. Car., Pa., Nebr. and Fla., but prefer not to make them types as none were associated with food plants. A single speci-

men from Arizona in coll. Townes has the same size and genitalia, and some of the brassy iridescence, but is much overlaid with white. It is certainly not *persius* or *afranius*. There are two broods, in May and July, but spring specimens seem rare.

Thanaos avinoffi Holland

1930. *Thanaos avinoffi* Holland, Ann. Carn. Mus. xix (3), 156.

1931. *Thanaos avinoffi* Holland, Butt. Book (Revised Ed.), 352, pl. li, figs. 28, 29.

1931. *Erynnis avinoffi* Lindsey, Bell and Williams, Denison Univ. Bull., Jour. Sci. Labs. xxvi, 62.

I have examined this only superficially but believe it a race of *persius*, whose food, willow, is a common species in the far north. A superficial examination of *T. propertuis* var. *borealis* Cary, from the Canadian Northwest, inclines me to believe it is also a *persius*-strain, and transitional to *avinoffi*.

NOTES ON NORTH AMERICAN NITIDULIDAE: POCADIUS

By C. T. Parsons.

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In addition to the four species of Pocadius treated below there are known seven from Asia, two from Brazil, and one each from Argentina, Cuba, Europe, and Africa.

Since *helvolus* extends southward into Mexico and Cuba, and *basalis* and *niger* n. sp. are found in Arizona and New Mexico, these species are probably of Neotropical origin. The California *fulvipennis*, although described from "Mexico," is related to the European *ferrugineus* in the shape and punctation of the elytra, profile of the prosternum, and characters of the female genitalia and is probably of Asiatic origin.

Helvolus, niger n. sp. and *basalis* are rather closely related and quite distinct from *fulvipennis*. In the use of the following key, figures 1-4 should be consulted.

1. Prosternum in profile strongly arcuate....*fulvipennis* Er.
   Prosternum in profile moderately arcuate or nearly plane ..... 2.
2. Prosternum behind the coxa plane, not deflexed ..... *basalis* Schaef.
   Prosternum behind the coxa more or less deflexed.....3.
3. Pronotum black with hind angles obtusely rounded ..... *niger* n. sp.
   Pronotum testaceous to piceous with hind angles acutely rounded ..... *helvolus* Er.

Pocadius fulvipennis Erichson

Pocadius fulvipennis Erichson, 1843, in Germar, Zeitschr. Ent., 4: 319.

Pocadius dorsalis Horn, 1879, Trans. Amer. Ent. Soc., 7: 311.

The color varies from black with a red basal spot on each elytron to testaceous. This species was described from "Mexico." *Dorsalis* was based on the black form. In the United States it is found only in California ranging from Los Angeles Co. to an altitude of 2,500 feet, Carrville, Trinity Co. The Carrville specimens are dated June 19. In Mr. H. C. Fall's collection is a specimen collected on March 17 in Marin Co. from the "puff ball *Lycoperdon giganteum.*"

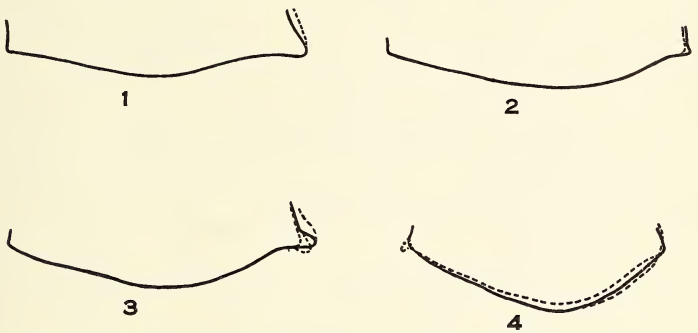

Fig. 1. Profile of the prosternum in *Pocadius*. The dotted lines show the extent of variation. 1, *P. basalis*, holotype in solid line; 2, *P. niger* n. sp., holotype in solid line; 3, *P. helvolus*, the usual form in solid line; 4, *P. fulvipennis*, lectotype of *P. dorsalis* in solid line. This is the usual form; the least arcuate outline in Fig. 4 is identical with that of the European *P. ferrugineus*.

Pocadius helvolus Erichson

Pocadius helvolus Erichson, 1843, in Germar, Zeitschr. Ent., 4: 320.

Pocadius breviusculus Reitter, 1876, Stettiner Ent. Zeit, 37: 318.

Pocadius ferrugineus Chevr., 1863, Am. Soc. Ent. France (4) 3: 604 (in error).

Pocadius infuscatus Reitter, 1874, Syst. Eintheil. Nitid., p. 94.

Pocadius limbatus Reitter, 1874, Syst. Eintheil. Nitid., p. 95.

Helvolus varies considerably in size, punctation, and color, ranging from pale testaceous to dark rufo-testaceous with the elytra black except at base. As a result Reitter has named three forms. In the Horn collection there are specimens compared with Reitter's types, and since these variations have no geographical significance they had better remain synonyms as Horn placed them.

Described from "North America" *helvolus* ranges from Stamford, Connecticut and West Point, New York to Thomasville, Georgia west to "B. C." (H. C. Fall coll.), "Montana" (Sharp), Nebraska, Kansas, eastern Texas (Columbus and Houston), and northwards to Aweme, Manitoba. The dates run from June to September. Specimens from New Jersey received from Mr. C. A. Frost were taken in *Lycoperdon giganteum*. It is recorded from Cuba by Chevrolat (under *ferrugineus*) and by Reitter (as *infuscatus* and *limbatus*). Sharp recorded this species from Mexico (Durango and Guanajuata).

Pocadius niger new species

Fig. 1 (*2*), Fig. 2 (*7*)

Broadly oval, robust; head and pronotum black, elsewhere dark piceous except for a somewhat triangular reddish brown spot on each elytron. Head coarsely irregularly punctured; front transversely impressed. Thorax as wide as long, narrowed in front; apex rather strongly emarginate; base arcuate, and feebly sinuate at each side. The sides of the thorax moderately and evenly arcuate, narrowly inflexed; hind angles obtusely rounded; disc convex, coarsely irregularly punctured. Sides of elytra feebly arcuate, apex truncately arcuate, sutural angle feebly dentiform; disc convex, with ten rows of distinct punctures (obscure near the sutural margin in the Arizona specimens); the intervals flat, irregularly biseriately punctulate, each puncture with a fulvous hair. Body beneath coarsely sparsely punctured. Length 4.3-3.2 mm., width 2.2-1.9 mm.

Described from thirteen specimens collected by Barber and Schwartz on June 8 at Las Vegas Hot Springs, New Mexico. The male holotype, allotype, and 6 paratypes in the U.S.N.M., one pair of paratypes in the Mus. Comp. Zoöl. and one paratype each in the collections of H. C. Fall and the writer. Also one paratype from the Pinal Mts., Arizona and one paratype from the Sierra Ancha Mts., Arizona in the collection of H. C. Fall.

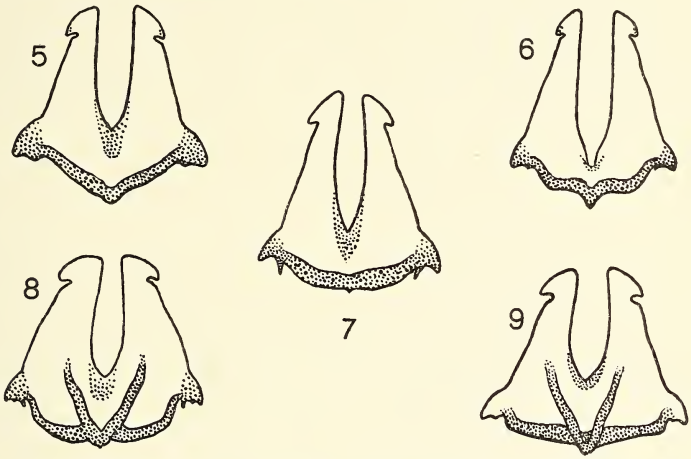

Fig. 2. Ventral views of the coxites of the female genitalia in Pocadius. 5, *P. basalis* Schaeffer (topotype); 6, *P. helvolus* Er.; 7, *P. niger* n. sp. (paratype); 8, *P. ferrugineus* L.; 9, *P. fulvipennis* Er.

This is the species listed by Fall and Cockerell in their New Mexican list as *fulvipennis*. In the profile of the prosternum, and characters of the female genitalia this species is intermediate between *helvolus* and *basalis*. It differs from both of them by being less oval, the prothorax black, more convex, with narrower margin, and more obtuse hind angles. The pubescence is longer and the punctation of the elytra, at least in the New Mexican specimens, more regular and distinct.

Pocadius basalis Schaeffer

Pocadius basalis Schaeffer, 1911, Journ. New York Ent. Soc., 19: 117.

Holotype and three paratypes labelled "VIII. 29, Huach. Mts. Ariz." and one without label are in the U.S.N.M. One female from the "Huach. Mts., Ariz," is in the writer's collection and evidently was collected with the types. There is no variation in these six specimens. *Niger* n. sp. approaches *basalis* in the punctation of the elytra, but this character is very variable in *helvolus* and the European *ferrugineus*.

For the privilege of examining material the writer is greatly indebted to E. A. Chapin (U.S.N.M.), P. J. Darlington (M.C.Z.), E. C. Van Dyke (Cal. Acad. Sci.), E. T. Cresson, Jr. (Phil. Acad. Sci.), H. C. Fall, and C. A. Frost.

A NEW LOCATION FOR PERIPATUS IN JAMAICA

W. Gardner Lynn

The Johns Hopkins University

The Island of Jamaica, B. W. I., is the habitat of two members of the Onychophora one of which, *Peripatus swainsonæ* Cockerell, is an endemic species, while the other, *Plicatoperipatus jamaicensis* (Grabham and Cockerell), is the sole representative of an endemic sub-genus. The history of the discovery of these animals and the facts as to their known distribution in Jamaica have recently been reviewed by E. A. Andrews (1933) and will be only briefly summarized here. The first recorded specimens from the island were collected by Philip Henry Gosse (1851) at Bluefields in the southwestern part of Jamaica, but were not at that time described as new. Forty years later (Grabham and Cockerell, 1892) Peripatus was again reported from Jamaica but from quite a different locality, near Bath in the southeastern portion of the island. These specimens were assigned to a new series. *Peripatus jamaicensis,* and Gosse's original collections were assumed to represent the same. During the succeeding years several hundreds of specimens were obtained from the Bath region and when critically examined by Bouvier they were found to belong to two distinct species. *Peripatus jamaicensis* was present in considerable numbers but the majority of the specimens were regarded as representing a new variety of the species *Peripatus juliformis* Guilding which received the name *P. juliformis* var. *swainsonæ* Cockerell and is so designated in Bouvier's (1905) monograph of the group. Gosse's original collection, of which three specimens were still extant in the British Museum, was also found to contain representatives of both these forms. Later in Clark's (1913) revision of the American species of Peripatus, a new sub-genus, *Plicatoperipatus,* was erected for the reception of the species *P. jamaicensis* and the variety

swainsonæ was elevated to specific rank under *Peripatus s. s.* In the time which has elapsed since the discovery of Peripatus at Bath, single specimens have been found at three other widely separated localities on the island. F. S. Conant collected an example of *P. jamaicensis* at Blue Hole near Port Antonio on the north coast in the summer of 1897; E. A. Andrews found *P. swainsonæ* near the Great River east of Montego Bay in 1910 and again at a locality very near Kingston, above Constant Springs, in 1932. All three of these specimens are to be found in the museum collection of the Johns Hopkins University. Peripatus has thus far been taken at five widely separated points in Jamaica which, if connected by straight lines, would surround

Figure 1—Outline map of Jamaica showing the six known localities for the Onychophora in that island. + = *Peripatus swainsonae*; O = *Plicatoperipatus jamaicensis.*

an area embracing more than half the island. However, as Andrews points out, it is by no means certain that the animal occurs in all or much of this intermediate area. All five of the known localities are at relatively low altitudes, 1,000 feet or less, and the presence of Peripatus in the central mountain chain with its highest peaks rising to over 7,000 feet, has remained to be established.

It was therefore with great interest that the writer, during the past summer, came upon Peripatus in the heart of the Blue Mountains at an altitude of nearly 5,000 feet. While collecting the eggs of the toad *Eleutherodactylus nubicola* (in connection with an embryological study aided by a grant from the National Research Council) a speci-

men of *Plicatoperipatus jamaicensis* was found beneath a rock near Morce's Gap. This gap is located between John Crow Peak and Bellevue Peak in the Parish of Portland at an elevation of 4,980 feet. It is but two miles north of the Cinchona plantation and through it passes the trail which leads from Silver Hill to Orange Bay. It is located in the region of perpetual rain-forest with an annual rainfall of 105.70 inches (Shreve, 1914). The specimen herein described was found only about one hundred yards from the gap, beside the trail which leads to Trafalgar Gap, the "Vinegar Hill Trail." Upon turning a rock the animal was seen crawling about slowly on a bare stone in the neighborhood of a few dead leaves. The ground was somewhat dry at this time, there having been no rain for several days. The specimen was induced to crawl upon a leaf and was then placed in an 8 oz. collecting jar without handling. However, when a portion of the animal's skin touched the collecting bottle a whitish substance was given off at the point of contact and two large drops also appeared at the openings of the mucous glands on the oral papillæ. An examination of the bottle revealed that it was one in which an alcoholic specimen had previously been kept and that it still retained a slight trace of alcohol odor. The Peripatus was immediately transferred to a clean bottle in which it was carried without harm for the rest of the day. The portion of the body which had come into contact with the wall of the first bottle formed a whitish blister-like swelling, however, which may be seen in the photographs (Fig. 2) and still remains in the preserved specimen. The animal was collected at about 2 P.M. on July 21. It was carried about during the rest of the day's collecting and was successfully transported to Chester Vale, some three miles distant, where it was photographed the same afternoon. It was kept in a large jar with a plentiful supply of dead leaves, the jar being wrapped in a moist cloth to give coolness and darkness. Here it remained quite active, moving about among the leaves and seemingly carrying on a normal existence. On July 27 it was preserved in Bouin's Fluid for sectioning. Before being preserved it was killed by exposure to the fumes of chloroform. At this time it

threw out its viscid white mucous from the oral papillæ to a distance of three inches and several thread-like strands of the substance also appeared from the posterior mucous glands. It had not been seen to do this during the week it

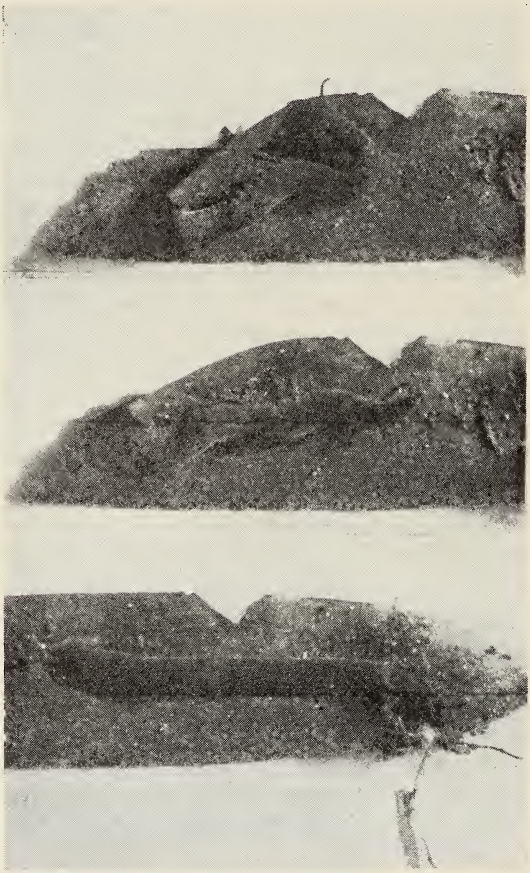

Figure 2. Three successive photographs of *Plicatoperipatus jamaicensis* crawling upon a leaf. Metric beneath lower figure.

was under observation which may lead to the conclusion that it did not feed, since Mme. Claude-Joseph (1928) describes the use of this substance in the capture of prey. When the specimen was immersed in Bouin's solution it was

found to be completely coated dorsally by a thin film of air and it was only when warm Bouin's was employed that a proper preservation was insured. The power of the skin of Peripatus to repel moisture by means of the coating of air which forms about the papillæ has frequently been noted (Claude-Joseph 1928, Andrews 1933). During life the animal was dark reddish-brown above and pinkish beneath; the papillæ appearing as an obscure peppering of light spots over the whole surface, with however some indication of an arrangement in four longitudinal rows on the dorsal side. Faint light stripes encircled the body opposite each pair of legs. The antennæ were brown with striking white tips (Fig. 2, lower photo) and were constantly moving about in all directions, sometimes even crossing each other. The body was 61 mm. long when extended; the antennæ about 5 mm. As preserved the body is contracted to 45 mm. and the antennæ to 3 mm. The individual is a female and has 38 pairs of legs. Only this one specimen was found even though much time was spent during June and July in turning rocks in this same general locality while collecting frog eggs. Possibly, however, a search in dead trees and logs would have revealed more specimens. Mme. Claude-Joseph found the Chilean species *Opisthopatus* (*Metaperipatus*) *blainvillei* quite commonly under the bark of dead tree trunks though it occurred only very rarely beneath stones and logs.

This sixth locality for Peripatus in Jamaica seems especially worthy of note since it lies within the area surrounded by the other known regions where Peripatus occurs, and in the heart of the Blue Mountains almost exactly mid-way between the north and south coasts. This apparently constitutes the first record of any member of the Onychopora from the Blue Mountain Range proper. Gosse's place of original discovery, Bluefields, is some eighty miles from the nearest part of the Blue Mountain chain and the three localities reported by Andrews (1911, 1933) are all in the lowlands near the coast. The Bath region lies in the foothills of the extreme eastern end of the Blue Mountain chain. In this connection attention may be called to a recent statement by Dr. C. T. Brues (1935) to

the effect that "The occurence of Onychophora in Jamaica is, however, so far as known, restricted to the Blue Mountains as none have been discovered in other parts of the island." Possibly this error is based upon a misunderstanding as to the locality of Bluefields, which in spite of the name is far distant from the Blue Mountains.

The great altitudinal range of *Plicatoperipatus jamaicensis* revealed by the present record is noteworthy. Unfortunately exact altitude records have not been given for most of the 60 or 70 described species of Peripatus. The greatest elevation reached by any species seems to be that attained by *Paraperipatus lorenzi* Horst which was reported from the Wichmann Mts. of Dutch New Guinea at 10,000 feet. *Oroperipatus cameranoi* (Bouvier) was collected in the region of Sigsig and Cuenca, Ecuador at an altitude of 2,550 meters (7,287 feet) and *Peripatus manni* Brues was recently recorded from near La Vesite, La Salle Plateau, Haiti at 5,000-7,000 feet. *Peripatoides* (*Ooperipatus*) *oviparus* (Dendy) is known from a number of localities in Victoria and New South Wales, Australia and Helms (1890) records it from Mt. Kosciusko in the latter province at an altitude of 5,700 feet, in a region frequently covered with several feet of snow for four or five months in the year. In addition to these Onychophora which are definitely recorded at considerable elevations in various parts of the world it is quite probable that a number of others of the Andean and Australasian forms may have come from comparable altitudes and that a careful check-up of the elevations of all the localities from which they are reported would reveal this. As to the altitudinal distribution of single species, however, less information is available. The present record extends the range of *P. jamaicensis* from sea level (the Blue Hole locality) to 5,000 feet. This range is rivaled by that of another Caribbean form *Epiperipatus biolleyi* (Bouvier) from Costa Rica which was found by M. P. Biolley near San Matteo at 250 meters and later by Picado at an altitude of 2,000 meters. Other instances of comparable ranges could undoubtedly be culled from the literature. For example *Peripatopsis moseleyi* Wood-Mason, which is found at Riet Vlei, Natal, at 5,000 feet has

also been collected near Port Elisabeth, Cape Colony, a seaport town; *Peripatoides oviparus* (Dendy) is not only recorded from Mt. Kosciusko but also from Pyalong and Warburton in Victoria, localities for which the International Map of the World shows altitudes of 200-300 meters; *Oroperipatus corradoi* (Camerano) comes from the Quito plain in Ecuador which is at 9,500 feet altitude but it is also reported from near Guayaquil on the coast. The ability of Peripatus to withstand the great range of conditions to which it must be subjected at these various altitudes would seem to be worthy of consideration in relation to the problem of dispersal of this animal. Also, the fact that individuals showing the same specific characters are found inhabiting such diverse regions may be regarded as further evidence of the very slight tendency towards speciation in this group, which has resulted in its retention of so many primitive characteristics.

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NOTES ON SOME HYDROPSYCHIDÆ

By Nathan Banks

Mr. Milne's third part of his Studies of Trichoptera having appeared and finishing the series, I offer certain remarks thereon, particularly on some Hydropsychidæ. Somewhat similar criticisms can be made of various other parts. Mr. Milne has on several occasions credited me with placing a name as a synonym when it was first done by others.

Thus under *Hydropsyche alternans* Walk. he puts *H. morosa* Bks. (nec. Hag.) as synonym. Now four years before I was born Hagen himself in his Phryganidarum Synopsis Synonomyica, p. 25, 1864, puts his *H. morosa* as equal to *alternans* Walk. McLachlan had indicated it the year before. Both I and Ulmer have simply accepted the dictum of Hagen and McLachlan.

In the type series of *H. morosa* now in the Museum there are five specimens of *alternans* and three of a *Cheumatopsyche* from Red River of the North. These three do not agree well with the description, but Milne has taken them to bear the name *morosa*. Therefore to keep the name *morosa* as Hagen, Ulmer, and I have kept it for seventy years, I have selected and marked as lectotpye of *Hydropsyche morosa* Hagen a male from "St. Lorenz, Canada, Sacken 1859," which is what has been commonly called *alternans* Walk. The three *Cheumatopsyche* from Red River are near to some of Hagen's types of *H. phalerata*. But since Ulmer has figured[1] (Selys Monographs fasc. VI, p. 66, 1907) a species of Hydropsyche as Hagen's *H. phalerata* (and some of Hagen's types were of this form) I have selected and marked as lectotype *Hydropsyche phalerata* Hagen a specimen from "Washington, Sacken," which is the species figured by Ulmer. This is much smaller than

[1]His dorsal figure shows apical joint of claspers too long.

the others of the *scalaris* group, with larger, fewer pale spots, and eyes of male wider apart than the diameter of an eye.

Following Ulmer, Martynov, Mosely, Navás, and Betten I am separating *Cheumatopsyche* (that is the *Hydropsychodes* of these authors) on the character used by Betten, the position of certain cross-veins; this appears to be constant.

Mosely informs me that the type species of *Hydropsychodes* has no closed median cell, and that Ulmer's figure is wrong; in any event *Cheumatopsyche* is an older name.

Another case is where I am credited with putting *H. dubitans* as a synonym of *N. crepuscularis*, although I had simply followed the statement of McLachlan (Revision European Trichoptera, p. 393, 1878) who had seen the types of both names. As to Walker's *Polycentropus crassicornis*, put as a synonym of *N. crepuscularis*, I examined a type in 1912 and saw that it was a *Phylocentropus*. Mr. Mosely informs me there are four types in the series, two (a male and female) of a *Plectrocnemia*, one female of a *Phylocentropus*, and one male of a *Neureclipsis*.

Mosley thinks (and I agree) that the name should be kept for the *Plectrocnemia*, and I select as lectotype of *Polycentropus crassicornis* Walk. a male in the type series which is a *Plectrocnemia;* all types are from Georgia.

Milne lumps under *H. scalaris* about all the forms that have the same general structure of the penis, ignoring further differences. In the male type of *H. scalaris* the apical joint of the clasper has a distinct hook at the end; the eyes of the male, although larger than in the female, are wider apart than the width of an eye. Betten, in sinking my *H. hageni*, has called attention to Hagen's statement that the eyes of the male *scalaris* were larger than the female. This is but a half-truth, for Hagen also says after the descripton that he has a male with still larger eyes, and adds "Is it different?".

I have selected and marked as lectotype of *Hydropsyche scalaris* Hagen a male from "St. Lorenz, Canada, Sacken." *H. hageni* is smaller and darker than *H. scalaris*, the male

eyes are less than the width of an eye apart. It is common in southern localities where the typical *scalaris* is not found. The last joint of the clasper is shorter and broader than in *scalaris*.

H. incommoda Hagen from Georgia is also put as a synonym by Milne. The superior plate is more nearly

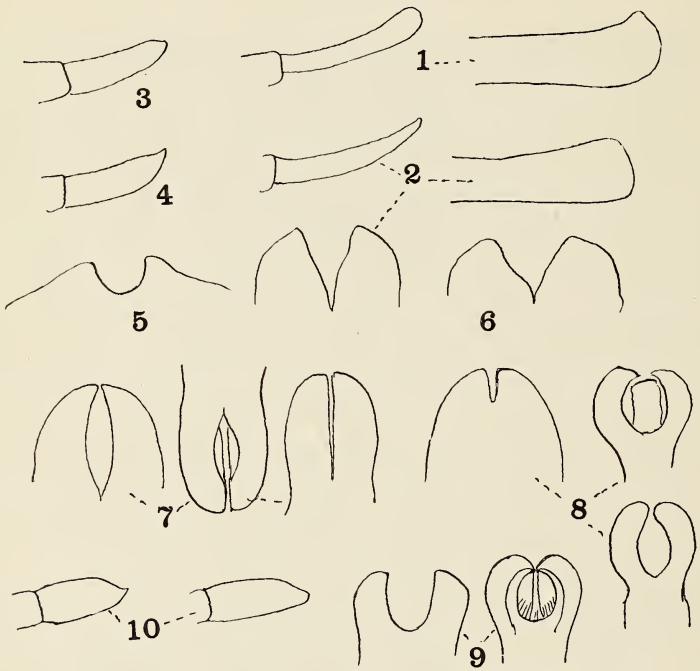

Fig. 1. Male genitalia of Hydropsyche. 1, *H. separata*, clasper and penis; 2, *H. reciproca*, clasper and penis, and superior plate; 3, *H. incommoda*, clasper; 4, *H. scalaris*, clasper; 5, *H. separata*, superior plate; 6, *H. depravata*, superior plate; 7, *H. scalaris*, superior plate, penis below and above; 8, *H. incommoda*, superior plate, penis, two specimens; 9, *H. phalerata*, superior plate, penis; 10, *H. hageni*, clasper, apical joint.

conical, with only a short incision, the apical joint of the clasper has the hook less distinct. The eyes of male are wide apart, further apart than in *H. scalaris*. It occurs also in Louisiana.

There are minor differences in these four forms, all of which, *scalaris hageni, incommoda, phalerata,* I consider distinct species, judging by the characters used in the separation of European species.

Mr. Milne has put at least two (perhaps three) forms under *Hydropsyche depravata* Hagen. *H. depravata* was described from a female from Georgia; a male from Georgia (same handwriting) appears to be the same species and Milne makes it the neoallotype. This has the apical part of the clasper slender, curved, and scarcely narrowed toward tip; the superior plate has a deep, triangular emargination.

In New England, Eastern New York, and Pennsylvania there is a fairly common species of the same group as *H. depravata.* It is as large as *H. scalaris,* darker and with more numerous and smaller spots, and in the male the eyes widely separated. The female is readily separated from *H. scalaris* by having the mid basitarsus dark and scarcely swollen (in *scalaris* extremely broad and very pale).

The apical part of the clasper is hardly as long as in *H. depravata* and plainly tapering toward the tip; the superior plate is deeply, acutely indented, the lobe each side being narrowed near the tip and pointed. This is probably *H. reciproca* Walk., and I shall so consider it. The type of Walker's species is a female and has lost the middle legs. *H. depravata* is probably the same.

From the western part of New York and further west is a form similar in size and markings. The superior plate has only a rather shallow, rounded emargination, and the apical part of the clasper is plainly somewhat clavate to-toward tip. This is certainly a different form from the Eastern species and I have named it

Hydropsyche separata sp. nov.

The fore wings are much spotted with gray, few in extreme apical part; the penis, seen from side, is rounded at tip, slightly swollen and almost pointed above (in *recip-*

roca not at all pointed above) ; the superior plate has a median rounded emargination, which when not shriveled, is as wide as deep; the male eyes wide apart. Apical part of claspers slightly enlarged at tip. The female has the mid basitarsus dark and but little swollen. The fore wing is 11 mm. long.

Type (and paratypes) from Westfield, N. Y., June and July 1905 (Woglum coll.). Others are from Saskatchewan, Scudder.

Polycentropus confusus Hagen was described from three specimens, two from Trenton Falls N. Y., and a female from Washington, D. C. One, a female, from Trenton Falls, N. Y. has the discal cell in the hind wings closed and is a *Plectrocnemia,* and is so treated by Betten, necessitating a change in *Plectrocnemia confusa,* Mosely. This specimen when I first saw the collection and until lately was the first specimen in the row. But the other specimen from Trenton Falls, N. Y. is a male, a true *Polycentropus.* In 1914 (Can. Ent.) I figured the genitalia of this species as *Polycentropus confusus;* I have therefore selected this Trenton Falls male as lectotype of *Polycentropus confusus* Hagen and so marked it. Thus Mosely's *Plectrocnemia* will not need renaming.

The selection of these lectotypes will result in keeping several of the Hagen names as they have been treated and figured, which, I believe, is better than to make the changes which have recently been put forward, and in each case the specific names is retained in the genus in which Hagen described it.

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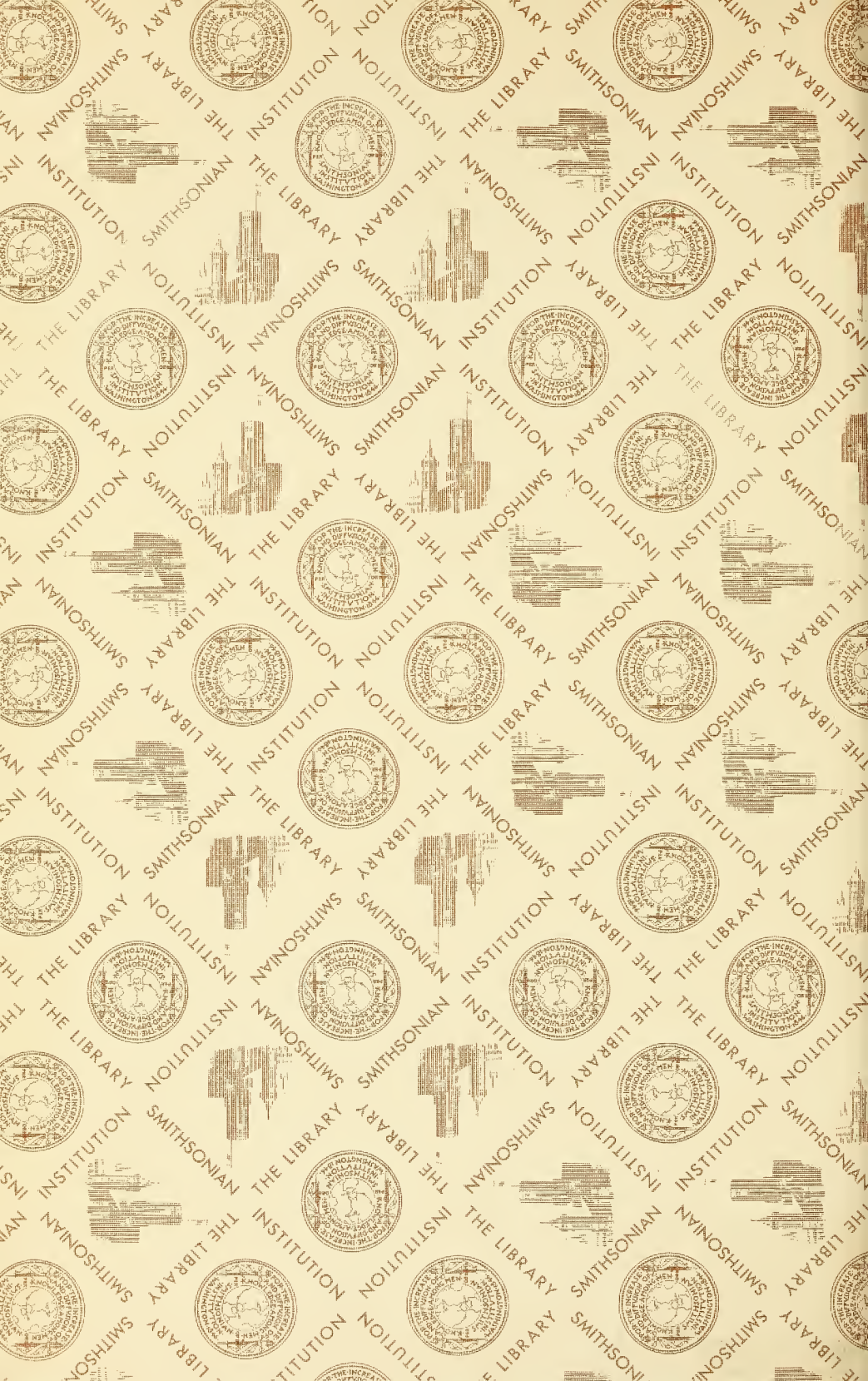
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