BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

Vol. XXVI 1931

EDITED BY

J. R. de la TORRE-BUENO

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, *Editor*

G. P. ENGELHARDT CARL GEO. SIEPMANN

THE SCIENCE PRESS
PRINTING COMPANY
LANCASTER, PA.

Vol. XXVI FEBRUARY, 1931 No. 1

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, Editor

CARL GEO. SIEPMAN GEO. P. ENGELHARDT

Published for the Society by the

Science Press Printing Co.,
Lime and Green Sts., Lancaster, Pa.,

Price, 60 cents Subscription, $2.50 per year

Mailed April 2, 1931

Entered as second-class matter January 21, 1919, at the post office at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

CONTENTS

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $2.50 per year; foreign, $2.75 in advance; single copies, 60 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE–BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

§ Insects

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXVI February, 1931 No. 1

A NEW GENUS AND SPECIES OF AEOLOTHRIPIDAE (THYSANOPTERA) FROM CHILE.

By J. Douglas Hood, University of Rochester.

The thrips described below was received for determination from Dr. Harold Morrison, of the Bureau of Entomology.

Dorythrips gen. nov.

δόρυ, a lance: *θριψ*

Allied closely to *Melanthrips* Haliday. Head with a prominent, slender projection extending directly forward between antennae, this projection deeply longitudinally sulcate above and with the sides extended upward into several pairs of teeth. Antennae 9-segmented, all distal segments freely movable; 3 and 4 each with a narrow, transverse, encircling sensory area close to tip. Maxillary palpi 3-segmented, middle segment somewhat the longest. Labial palpi 2-segmented. Fore tibiae with two slender spurs at tip. Wings broad, of nearly equal width throughout.

Genotype: **Dorythrips chilensis** sp. nov.

Though no other known thrips possesses such a cephalic armature, the genus is not at all an aberrant one in other features. Its affinities are decidedly with *Melanthrips* Haliday, of which it is merely an elaboration. In other related genera, such as *Ankothrips* Crawford and *Cranothrips* Bagnall, somewhat similar projections, nearly always toothed, are found on either the first or second antennal segments. There is evidently a decided tendency among the *Melanthrips* derivatives to develop projections at the anterior end of the body.

Dorythrips chilensis sp. nov. (Fig. 1, a, b, c.)

Female (macropterous).—Length about 1.3 mm. Color nearly uniform dark brown; tarsi usually somewhat paler; segment 3 of antennae paler at base, and, with segment 2, somewhat yellowish; fore wings brown, uniform in color save for the slightly darkened scale and tip; hind wings nearly colorless, darkened basally.

Head (Fig. 1, a) about 1.4 times as wide as length from front margin of eyes; cheeks swollen; frontal projection (Fig. 1, b, c) surpassing tip of first antennal segment, deeply grooved above, and with three or four dorsally-directed teeth along either side; one pair of prominent bristles located midway between posterior ocelli and the anterior ocellus, and three pairs behind eyes; ventral surface of head with a still longer pair arising close to inner anterior angles of eyes. Antennae almostly exactly as in *Melanthrips,* but with the sensory areas on segments 3 and 4 strictly transverse and almost completely encircling the antennae; 5–7 with the usual ventral sense cone.

Prothorax slightly longer than length of head (measuring to anterior margin of eyes) and with the usual numerous, stout, dark setae disposed to leave a bare median strip; one pair near anterior angles, one on anterior margin, one at middle of sides, and two near posterior angles usually very slightly longer and stronger than others. Fore legs moderately stout; fore tibiae each with two slender spurs at tip, these not at all broadened. Wings with normal venation; anterior and posterior veins each with about 25 setae.

Abdomen of normal form; tenth segment not divided above.

Measurements of holotype: Length 1.28 mm.; head, length to front margin of eyes 0.130 mm., greatest width 0.184 mm.; eyes, length 0.076 mm., width 0.056 mm., interval 0.060 mm.; prothorax, length 0.140 mm., width (approximate) 0.240 mm.; abdomen, greatest width 0.375 mm.

Antennal segments..	1	2	3	4	5	6	7	8	9
Length (μ)	37	52	72	61	46	51	37	25	22
Width (μ)	32	31	23	24	22	23	21	16	10

Total length of antenna 0.403 mm.

Described from three females, taken at Santiago, Chile, "at the close of winter," flying among the flowers of Colliguai ("a common euphorbiaceous plant of Central Chile"), by Dr. Aureliano Oyarzún. The types are in the writer's collection.

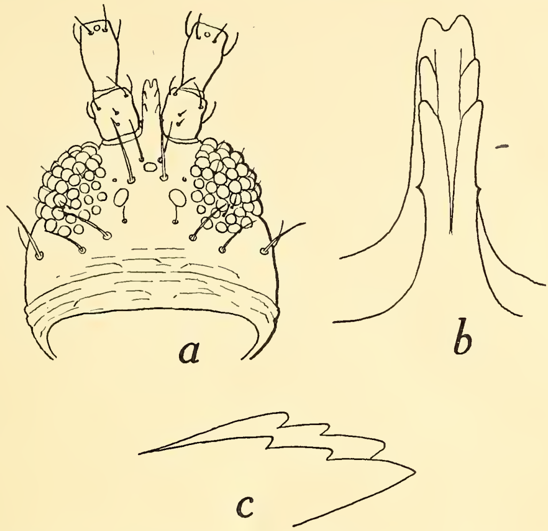


Figure 1. *Dorythrips chilensis* gen. et sp. nov.
a. Dorsal view of head, ♀, holotype.
b. Dorsal view of cephalic projection, ♀, paratype.
c. Lateral view of cephalic projection, ♀, paratype.

Mylabris (Bruchus) atomus Fall.—This species was described from material taken by Mr. Fred Blanchard at Hyannis, Mass. On July 5, 1930, both Dr. J. P. Bill and myself took series of this minute beetle by sweeping *Hudsonia ericoides* L. growing on the sand dunes back of the beach at Dennis, on the Massachusetts Bay side of Cape Cod. The plant which this species frequents seems not to have been recorded before.—C. A. Frost, Framingham, Mass.

Amblyteles semicaeruleus Cress.—This species seems to be rather rare in these parts. My only specimen, a female, was taken from under some loose bark on a fallen tree after a heavy rain near Cheoah, N. C., October 24, 1930.—S. B. Denton, Robbinsville, N. C.

THE COCOONING HABIT OF THE WASP, MONOBIA QUADRIDENS.

By Phil Rau, Kirkwood, Mo.

Monobia quadridens occupies the old tunnels in wood made by the giant carpenter-bee, *Xylocopa virginica.* The cells are separated by double mud partitions, and the aperture sealed with a mud plug.[1]

I have already stated that the larva of this wasp spins no cocoon. I have subsequently found that not only is this true, but that the larva hibernates, naked and uprotected save by the walls of wood, and transforms into a pupa in the early spring. In the region about St. Louis, some winters are more severe than others, and I am inclined to think that the mortality is greater among these hibernants during severe winters than in mild ones. The winter of 1929–30 was more severe than usual, the temperature going below zero several times, sometimes as low as minus 10 or 12 degrees.

During the winter the mortality of *Xylocopa virginica* (which hibernates as adults in the wood tunnels) was heavy.[2] *M. quadridens* occupying similar burrows, suffered an even greater degree of mortality than did *Xylocopa.* During the following spring, when I found that only one adult emerged from one lot of 20 such burrows plugged by *Monobia,* and in another location three adults emerged from a lot of 29 burrows, I chopped open the galleries to learn the reason. There I found many soft, dead, fully grown larvae, untouched by parasites or disease, that had died before they pupated. When one considers that each mud-plugged opening represented from two to four young, one gets a conception of the enormous mortality. Under such circumstances, one wonders if death would have been less prevalent if the organisms had had the added protection of a cocoon.

M. quadridens was not always cocoonless. At some time in the phylogeny of the species a cocoon was probably made, for even now in the cells one sees a vestige of this cocooning habit. Scattered about the walls of the burrows and on the mud partitions,

---

[1] Wasp Studies Afield, pp. 346–354. 1918.

[2] Paper in course of publication.

one often finds a veneer of thin, paper-like material, which has evidently been made by the larva in an effort to hold fast to a long lost habit. This veneer varies in area, thickness and location. It is very similar to that which we find in certain Eumenid wasps which make no pupal covering. This habit of using this scanty material, insufficient as it is for a cocoon, is undoubtedly a vestige of a cocoon-making habit. Whether the larva is made more comfortable by having some of the walls of its cell thus painted can hardly be asserted, since the condition occurs in only a part of the cells, and even there only a portion of the wall is so covered. I believe rather that a more logical explanation of the phenomenon is that it is of physiological necessity to the organism to have the body cleared of this material before transforming. I go into detail here merely to impress the reader with the fact that no real cocoon is made, because this is of importance in relation to the details that are to follow.

In September, a nest of *Monobia* was cut open longitudinally. As soon as the live larvae were exposed to view, a piece of cotton was lightly plugged into each opening, and so one by one they were all covered; the board in which they nested was carried into laboratory. A month later, when an examination was made, all the larvae were found to be in good condition. In one cell, however, where the cotton had been pressed too close, it adhered to the wood firmly, and when it was pulled away by force, I found that attached to it was a cocoon. This of course was cherished for the parasite which I assumed would emerge therefrom. When in due time no parasite emerged, the cocoon was opened, and there was found a dead larva of *M. quadridens.* Closer investigation proved that the structure was not a complete cocoon, but a wall built by the larva against the cotton so as to form a perfect covering for the anterior half of the body. It was thus impossible to separate the cotton from this material, since the fibers were mixed with it. The material of this shell was of the same kind and color as that which is sometimes seen in small quantity as a veneer on the interior of the cells, only in this case the wall of it was much thicker and reminded one, by its tenacity, of the cocoons made by *Odynerus dorsalis. Eumenes fraterna* likewise lines the interior of the pots with a similar, papery substance. It is interesting to note the occurrence of this phenomenon in the representatives of three distinct genera of this family.

Since a *Monobia* cell is protected by walls of wood, a cocoon might seem superfluous, and the species has almost lost the habit of making one. However, it seems that in times of need, as in the instance cited above, the vestigial instinct of cocooning can display itself in the building of a heavy sheath. This sheath, as I have said, resembles to a very great extent the heavy cocoon material of an allied species, *Odynerus dorsalis,* which needs a heavy cocoon for protection in its underground abode. This, I think, is a very fortunate find in that it substantiates the statements of Wheeler,[3] quoting Schroeder, who has experimented with a leaf-roller caterpillar. " 'When the spinning glands are exhausted, or when there is no opportunity to construct the case in the typical manner, phylogenetically older instincts, which are still manifested by other species of the genus, are released.' " Again (p. 13), " 'It is evident that in all cases like those above cited, vestigial instincts become manifest through the incidence of unusual conditions.' "

M. quadridens always makes a double-walled partition between the cells, and a vestibule near the doorway. The purpose of this I do not know, but it does give each cell an insulated space. Possibly the construction of the double-walled partition counterbalanced in a way the loss of the cocoon-spinning, but if so it availed the species very little hereabouts during the hard winter of 1929–30. Neither did the double wall keep out parasites, for in one nest of three cells, all of the young were parasitized by cuckoo-bees, *Chrysis* sp.

Abstrulia tessellata Melsh.—This peculiarly marked beetle was once taken from tanglefoot on the trunk of a large white oak in Sherborn, Mass. A live specimen was taken by sifting near the pond in Framingham, Mass., on June 13, 1930. The above records show indications of its comparative rarity or peculiar habitat in this locality.—C. A. Frost, Framingham, Mass.

[3] Am. Journ. Psychology 19: 9–10. 1908.

A NEW GENUS AND SPECIES OF BIBIONID DIPTERA.

By Charles P. Alexander, Amherst, Massachusetts.

In an extensive collection of Tipulidae from British Columbia sent to me for identification by Professor G. J. Spencer, there was included a single specimen of a fly that I must consider as representing an undefined genus and species. It is confidently expected that this particular insect will result in much discussion as to its true systematic position. The general appearance is much like *Pachyneura* but in the venation the accepted characters of the Anisopodidae and Bibionidae are curiously combined.

Genus **Cramptonomyia** novum.

Rostrum and labial palpi relatively small; maxillary palpi elongate, about one-half the length of the antennae. Antennae 16-segmented; scapal segments small, the first a trifle larger; flagellar segments cylindrical, gradually decreasing in length outwardly, the terminal segment about one-third longer than the penultimate, pointed at apex; flagellar segments with delicate erect setulae and scattered verticils that are shorter than the segments. Ocelli three, forming a close triangle. Halteres elongate. Legs with the tibiae about one-half longer than the femora; tibial spurs longer than the diameter of tibia at apex. Wings (Figures 1 and 2) with Sc_1 ending opposite *r-m*, Sc_2 far from its tip, being placed just beyond origin of *Rs*; three branches of *R* reach the margin; free portion of R_2 lacking, in some lights apparently represented by a faint line bisecting the stigma; basal section of R_4 appearing as a strong transverse element that simulates a crossvein, placed just before the level of proximal end of stigma; media with four branches reaching the margin, the anterior fork very deep, the vein M_{1+2} forking at or just beyond *r-m*; basal section of M_3 long and gently sinuous; cell *1st* M_2 closed; main stem of *M* faint and subevanescent except immediately before its fork; a single anal vein. Apical cells of wing with scattered macrotrichia.

Genotype.—**Cramptonomyia spenceri** n. sp. (Western Nearctic Region).

It is with very great pleasure that I dedicate this genus to Dr. G. Chester Crampton, in recognition of his work on the phylogeny and morphology of the Diptera. In the above discussion I have omitted detailed mention of the mouthparts, thoracic sclerites and genitalia, all of which will be described and figured in subsequent papers by Dr. Crampton.

Cramptonomyia spenceri n. sp.

Female.—Length about 11 mm.; wing 10.2 mm.; antenna about 3.5 mm.

Front and the reduced rostrum yellowish gray; palpi black. Antennae black throughout. Head gray, more infuscated on the anterior vertex. Ocellar triangle dusky.

Pronotum gray. Anterior lateral pretergites restrictedly bright yellow. Mesonotum brownish gray, the median region of the praescutum more infuscated, scutellum dark brown, obscure yellow beneath; postnotal mediotergite gray. Pleura uniform gray, the dorso-pleural membrane more buffy. Halteres obscure yellow. Legs with the coxae yellow, sparsely gray pruinose; trochanters yellow; femora obscure yellow; tibiae dark brown; tarsi black. Wings (Figures 1 and 2) yellowish, the oval stigma dark brown; weak dusky suffusions in base of cell *Sc* immediately beyond *h*; on cord; and as vague seams along the veins of the Medial, Cubital and Anal fields; veins chiefly dark. Sparse macrotrichia in the stigmal darkening and outer ends of cells R_2 to M_1 inclusive. Venation as described under the generic diagnosis.

Abdomen elongate; tergites bicolorous, their bases dark brown, the apices obscure yellow; sternites more uniformly obscure yellow; outer segments more uniformly darkened, the cerci blackish gray.

Habitat: British Columbia. *Holotype:* ♀, Vancouver, March 30, 1930 (*G. J. Spencer*). Type returned to Professor Spencer.

I take great pleasure in naming this species in honor of Professor G. J. Spencer, who collected the unique type.

As stated in the introductory paragraph, the present insect presents some very puzzling venational characters. The affinities of the fly would seem unquestionably to lie with *Plecia* Wiedemann (1828), *Pachyneura* Zetterstedt (1838) and *Hesperinus* Walker (1848). These three genera, and especially the two last, have caused much trouble in the past when the necessity arose to place them within definite families. The various positions assigned these genera are as follows:

Kertész (Cat. Dipterorum, 1; 1902) recognized a subfamily Pachyneurinae in the Bibionidae to include *Pachyneura* and *Hesperinus, Plecia* being retained in the subfamily Bibioninae. Williston (Man. N. Amer. Dipt., Ed. 3: 142–143; 1908) recognized in the Bibionidae the subfamily Pachyneurinae, referring to it *Hesperinus* and *Hesperodes* Coquillett (Ent. News, 11: 429; 1900), as well as the Palaearctic *Pachyneura.* Johannsen (Maine Agr. Expt. Sta., Bull. 172: 216; 1909) considered the Pachyneurinae as being Mycetophilidae, correctly placed *Hesperodes* as a Ceroplatine Mycetophilid, and referred *Hesperinus* tentatively to the Boletophiline Mycetophilidae, though noting its resemblance to *Plecia* and definitely stating that it should be placed with the Bibionidae. Crampton (Ann. Ent. Soc. Amer., 18: 49–74; 1925), in a notable study of the thoracic sclerites of Nematocerous Diptera, indicates the close relationships existing between *Plecia* and *Hesperinus.* Edwards (Diptera, Fam. Protorhyphidae, Anisopodidae, Pachyneuridae, Trichoceridae. Genera Insectorum, Fasc. 190: 1–41, 2 pls.; 1928), following Handlirsch, has recognized the Pachyneuridae as a family and refers to it not only *Pachyneura* but also *Axymyia* McAtee (Proc. Ent. Soc. Washington, 23: 49; 1921). Edwards retains *Plecia* and *Hesperinus* in the Bibionidae. In his opinion, *Pachyneura* has more features in common with the Anisopodidae than with either the Bibionidae or the Mycetophilidae.

I am not fully convinced of the justification for placing *Pachyneura* in a family distinct from *Plecia* and *Hesperinus.* The discovery of the fly above described as new would tend to support this view. In the venation of the medial field, *Cramptonomyia* seems closer to the Anisopodidae, but the course of the branches of the radial sector is almost exactly as in *Pachyneura,* showing no tendency of the anterior branch to swing cephalad and finally to become fused apically with R_{1+2}, as is the case in the Anisopodidae. Likewise the downward curvature of the distal section of Cu_1 is a character of the Pachyneurine flies. The profound fork of M_{1+2}, together with the strong free basal section of vein R_4, gives the genus *Cramptonomyia* a very distinctive appearance. A comparison of this fly with *Pachyneura,* especially in the light of the interpretation of the modification of the radial field of the Diptera as proposed by the writer (IV. Internat. Congress Ent., 2: 700–707, pl. 3, fig. 6; 1929) makes it seem possible that the element there held to be R_3 is really the free portion of R_2 before

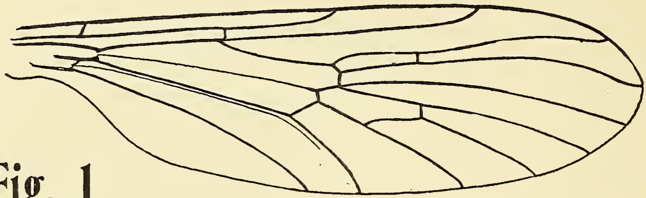


Fig. 1

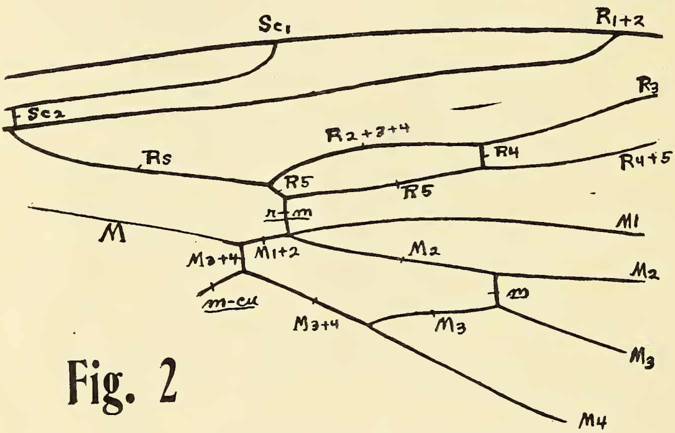


Fig. 2

EXPLANATION OF FIGURES.

Fig. 1. Wing-venation of *Cramptonomyia spenceri,* gen. et. sp. n.

Fig. 2. The same; details of radial and medial fields.

its apical fusion with R_1 and that the two main branches of the radial sector in *Pachyneura* should be interpreted as is done in the present paper for *Cramptonomyia.* Until more evidence is forthcoming, I am inclined to place the new genus in the near vicinity of *Pachyneura* but must also consider that *Plecia* and *Hesperinus* fall in the same general group.

The four genera may be separated as follows:

1. Antennae with 16–18 segments 2
   Antennae with from 8 to 12 segments 3

2. Four branches of *R* and three of *M* reach the wing-margin. *Pachyneura* Zetterstedt
   Three branches of *R* and four of *M* reach the wing-margin. **Cramptonomyia** nov.

3. Antennae with only 8 or 9 segments......*Plecia* Wiedemann
   Antennae with 12 segments..............*Hesperinus* Walker

The fly described by Garrett (Sixty-one New Diptera, privately printed, pp. 11–12; 1925) as *Hesperinus flagellaria,* likewise from British Columbia, seems undoubtedly to be correctly placed in *Hesperinus.*

A Curious Lepidopterous Larva.—On Pahmeeung Mountain, in northern Siam, January 19, 1928, Miss Alice Mackie found a very curious Lepidopterous larva, about 50 mm. long, feeding on a wild plant of the ginger family. It was greenish white, covered with long (about 10–12 mm.) white feather-like filaments, readily deciduous, of a waxy nature; the head was prominent, rounded, the body behind it narrow and constricted; large red Y-shaped marks along back, the stem of the Y directed caudad; mouth region black.

On February 9 we bred from this a skipper butterfly, *Gangara thyrsis* (Fabricius). It is a species common throughout the plains of India, Burma and Ceylon, the larva said to be more or less destructive to palms.

This caterpillar looks like a sort of gigantic mealy-bug, or perhaps even more like those Coccinellid larvae which have waxy filaments. What is the purpose of this exuberance of waxy filaments? Does it render the larvae distasteful to birds? They are certainly very conspicuous.

Also on Pahmeeung Mountain we found a large sphingid larva with the anterior region broadly expanded just like a cobra's head, even with a dorsal spot as in a cobra. This extraordinary resemblance has surely no significance in connection with cobras, which do not exist in the locality. This larva was not bred.—T. D. A. Cockerell, Boulder, Colorado.

COLEOPTERA BY "SMOKING" STUMPS.

Hugh B. Leech, Univ. Brit. Col., Vancouver, B. C.

Several rather interesting species of Coleoptera may be obtained by "smoking" certain old stumps, during the early spring, and before a net is of much use. The procedure is very simple, and the average results will fully compensate the necessary labour.

Well-rotted coniferous stumps, about four feet high, and with the bark still on, are the most suitable to work with. It is best to scrape mosses and lichens from the tops, to facilitate the capture of small species; shrubs may be cut, so as to give an unobstructed view of the sides. A small hole should be made through the bark, a few inches above the ground, and on the windward side. A single match will usually start the stump smouldering, though in some cases it may be necessary to cut extra holes near the top, so as to create a draught.

As soon as the smoke has found its way to all parts of the stump, one must watch the top and sides for beetles. In this district (Salmon Arm, B. C.) *Elater pullus* Germ. is usually the first to emerge. Shortly after, one may expect *Elater cordifer* Lec., *Elater phoenicopterus* Germ., *Ludius moerens* Lec., and *Ptinus californicus* Pic.

Adelocera rorulenta Lec., and *Adelocera profusa* Cand. emerge suddenly and fly readily. *Alaus melanops* Lec. appears at first to be utterly bewildered, but soon recovers and takes wings. *Calitys scabra* Thunb., *Ostoma ferruginea* L., *Ostoma pippingskoeldi* Mann., and *Eleates explanatus* Csy., come out of holes in the bark, and are easily missed. These last four species will in most cases prove to be interested in fungi rather than in using the stub for shelter.

Depending upon the condition of the stumps, the following species have been taken in the same manner:

Iphthimus serratus Mann.
Coelocnemis columbiana Csy.
Platydema oregonense Lec.
Carabus toedatus var. near *oregonus* Lec.
Eurelymis atra Lec.

THE GENUS APHELONOTUS (HEMIPTERA, NABIDAE).

By Halbert M. Harris, Ames, Iowa.

Aphelonotus, a singular and heretofore monotypic genus, was erected by Uhler in 1894 for a new species, *simplus* from Grenada. The genus was considered by Uhler as being closely related to *Pachynomus* Klug and was therefore placed in the family Nabidae. Champion in 1899 in treating of the Central American hemiptera discovered and figured a species from Guatemala which he determined as *A. simplus* Uhler. He followed Uhler in placing the genus in the Nabidae but called attention to its strong resemblance to the reduviid group *Piratinae* and he noted that his specimens were slightly larger than Uhler's and that they had more completely developed membranes. Later (1908) Reuter, in writing of *A. simplus,* regarded the beak as being composed of only three segments and because of this, the presence of ocelli, the five-segmented antennae, and especially the character of the venation of the membrane, was led to consider the genus as being truly a reduviid one and as belonging to the sub-family Piratinae. That Reuter erred, however, in considering the beak three-jointed is readily shown by an examination of any of the species. The beak in its entirety is short and to be sure is reduviid-like in appearance but it is distinctly four-segmented (see Pl. I, fig. 4). We must note that it is now more or less commonly accepted that the difference in a so-called "four-segmented" beak and a "three-segmented" one, in many cases in the Hemiptera, is only a difference in the relative development of the basal segment—the beak in its entirety really consisting of four segments.

In 1928 the writer called attention to the apparent similarity in many body characters of *Aphelonotus* Uhler and *Pachynomus* Klug. A re-examination of these genera with more material at hand has served only to convince him further of their true likeness. The antennae in both are composed of five distinct segments. The rostrum is four segmented, even more evidently and distinctly so in the former than in the latter. The legs are similarly constructed and similarly armed. The pronota are almost identical in structure. The prosternal xyphus in *Aphelonotus* is provided with a fovea-like groove for the reception of the tip of the beak, a character which served to further convince Reuter of the reduviid nature of the genus. An examination of *Pachynomus biguttatus* and of *P. lethierryi,* however, discloses that these likewise are provided with such a groove and, moreover, that it may be slightly granulose (not striated as Reuter says) as it is in *Aphelonotus.* This was to be not unexpected for even many of the species of the more truly nabid groups, *Prostemma* and *Pagasa,* show evidence of this prosternal fovea—it being fairly well developed in some species.

A careful diagnosis of the two genera thus establishes their similarity in structure in practically every way except in the nature of the venation of the membrane (I have, unfortunately, not been able to compare the genitalia). The presence of ocelli in *Aphelonotus* must be considered, of course, as a character of generic rank only, as some reduviid as well as nabid genera, and to be sure at least one species of *Nabis,* lack ocelli. The venation of the membrane of *Aphelonotus,* on the other hand (fig. 5), appears strictly reduviid in nature. The writer has recently described, however, two new species of *Pachynomus* from South America in which the membranal venation is almost identical with that of *Aphelonotus.* In these new species—the first representatives of the genus from the western hemisphere—the membrane actually shows a faint trace of the marginal veins characteristic of the Nabidae. Thus as more material becomes available our studies lead us to place these two genera, *Aphelonotus* and *Pachynomus,* nearer together, whether we speak of them as Reduviidae or Nabidae. In either case we are forced to acknowledge the fact that our so-called " natural groups " exist only in our imagination—in nature they blend one into the other so that as we come to know more forms our man-made categories ever approach more closely and thus are ever harder for us to separate. Perhaps from a phylogenetic standpoint *Aphelonotus* may be considered as a genus standing nearest of any of our living groups to the bases or separation points of the branches representing the *Reduviidae* and the *Nabidae* and therefore as a sort of annectant genus.

On this basis I am constrained to think of *Aphelonotus* Uhler as being nearest *Pachynomus* Klug and therefore as belonging to the nabid subfamily *Pachynominae.* A critical examination of the few available specimens of the genus proves it to be composed of at least five remarkably closely related species where only one has heretofore been recognized.

APHELONOTUS Uhler.

1894. *Aphelonotus* Uhler, Proc. Zool. Soc. London, 1894, p. 208.
1899. *Aphelonotus* Champion, Biol. Centr. Amer., Rhyn., Heter., II: 297.
1908. *Aphelonotus* Reuter, Mem. Soc. Ent., Belg. 15: 91.
1928. *Aphelonotus* Harris, Entomologica Americana, 9 (n. s.): 3.

Small, oblong, somewhat shiny, thickly pubescent. Head moderately long, the anteocular part sub-cylindrical, the post-ocular part parallel-sided, vertex rather convex, collum short. Eyes only moderately large, not prominent or protruding, somewhat granular, as seen from the side occupying nearly the full depth of head, their hind margins thus seen strongly concave. Ocelli conspicuous, placed behind a line joining the hind margins of eyes. Antennae moderately long; segment I stout, extending well beyond apex of head, II and III cylindrical, II nearly twice as long as I and slightly longer than III; IV and V thin and clothed with numerous fine long hairs. Rostrum short and stout, four segmented, segment I very short, III slightly longer than II, tapered apically, IV nearly as long as II (fig. 4).

Pronotum about twice as wide as long, very feebly arched, with only faint evidence of ring-like collar, the sides slightly and evenly rounded, not margined; transverse depression placed near base; anterior lobe in front with a small, sunken, well delimited, triangular area, the apex of which is continued as a median longitudinal furrow extending to the transverse depression; posterior lobe broadly emarginate so that the mesoscutum is left exposed and the humeri appear as though produced. Scutellum triangular, somewhat arched, slightly broader than long, faintly depressed across the middle and likewise down the middle of the basal half. Hemelytra well developed, the clavus linear, its inner and outer margin and the outer margin or corium paralleled by rows of coarse punctures; corium abruptly cut off at apex of scutellum; embolium strongly widened distally, extending outward beyond apex of corium for a distance about equal to length of corium, its apical third dull; membrane well developed, its base transverse behind corium and longitudinal along embolium so that when the hemelytra are in repose the membranes together occupy a broad rectangular area having its beginning immediately behind the scutellum, with two longitudinal cells from the outer margin of each of which there extends an unbranched vein (fig. 5). Anterior femora strongly incrassate, armed beneath with a double row of piceous teeth; intermediate and posterior femora slightly incrassate, armed (the posterior ones at times obsoletely so) as the anterior; anterior tibiae curved, provided with small apical pads, dentate within, intermediate ones likewise dentate within, all tibiae thickly pilose and provided with apical combs. Prosternum short, with a simple fovea for the reception of the beak; mesosternum longitudinally carinate down the middle; metasternum somewhat cordate, with a median ridge; metapleuron flat, granulose, without evidence of ostiole or canal. Abdomen depressed, closely pubescent. Male genital segment plump, with the claspers in repose lying crossed above the anal opening.

Type of genus, *A. simplus* Uhler.

Distribution: Neotropical.

KEY TO SPECIES OF APHELONOTUS.

1. Smaller, 4 mm. or less in length; yellowish brown; width of head not or scarcely more than twice as great as width of vertex; ocelli placed closer to eyes than to each other 2
   Larger, 4.6 mm. or more in length; fuscous brown, width of head two and one half times as great as width of vertex; ocelli about equally as far from eyes as from each other...4
2. Membrane attaining apex of abdomen; posterior femora provided beneath along apical third with three slender piceous teeth 3
   Membrane not attaining apex of abdomen; posterior femora unarmed; male clasper as in fig. 1 ....*simplus* Uhler
3. Scutellum without a median irregular canal in basal depression; width of head twice width of vertex; 3.24 mm. **confusus** n. sp.
   Scutellum with an irregular median canal in the basal depression; width of head distinctly less than twice width of vertex; male clasper as in fig. 2; 4 mm. ....**fraterculus** n. sp.
4. Antennal II slightly less than twice as long as I; male clasper as in fig. 3; length 4.65 mm. ....**medius** n. sp.
   Antennal II slightly more than twice as long as I; larger, length 6.8 mm. ....**major** n. sp.

1. **Aphelonotus confusus** n. sp.

Similar in size and coloration to *simplus* Uhler, from which it is to be recognized by the slightly broader eyes and correspondingly narrower vertex, the absence of a longitudinal canal in the basal depression of scutellum, the membrane attaining the apex of abdomen, and by the presence of three fine, piceous, spine-like teeth on the lower surface of the apical fourth of the hind femora. Length, 3.24 mm.; width, 1.04 mm.

Holotype, female, Madeira River above Manaos, Brazil, September, 1923, Lee Prizer, in collection of U. S. National Museum. *Paratypes,* two females, taken with holotype.

This species may prove, upon the acquisition of more material, to be inseparable from *A. simplus* Uhler. The writer deems it best, however, in view of the differences noted above and of the remarkable homogeneity of the other species to consider it as distinct.

2. *Aphelonotus simplus* Uhler.

1894. *Aphelonotus simplus* Uhler, Proc. Zool. Soc. Lond. for 1894, p. 209.

1899. *Aphelonotus simplus* Champion, Biol. Centr.-Amer., Rhyn., Heter., II: 297.

1908. *Aphelonotus simplus* Reuter, Mem. Soc. Ent. Belg., XV: 91.

Small, pale yellowish brown, the head, anterior lobe of pronotum, and scutellum darker. Head about one third longer than broad (26:20), the postocular part shorter than width of vertex (5:10). Eyes small. Ocelli placed much closer to the eyes than to each other. Antennae pale, proportional length of segments, 11:19:18:20:22. Rostrum short and stout, the third segment subequal in length to first of antennae. Pronotum twice as wide as long (48:24), the transverse furrow beset with coarse punctures. Scutellum with the anterior depression slightly granulose and bearing an obscure median canal. Hemelytra with membrane scarcely reaching beyond middle of last abdominal segment. Anterior femora, as seen from the side, about two and one-half times as long as deep (45:18); anterior trochanters armed with two, or at times three, small piceous teeth. Posterior femora without evidence of piceous teeth. Male claspers (fig. 1) short, in repose the apex of one scarcely reaching to the base of the other. Length, 3.2 mm.; width, 1.0 mm.

Originally described from seven specimens taken on the Mount Gay estate, Grenada, W. I. The above description is made from three specimens (cotypes) from the Uhler collection in the U. S. National Museum and three specimens (taken with the cotypes and bearing the same date-locality number, 115) from the H. E. Summers' collection at Iowa State College. The specimens were said to have been taken under leaves in a thicket on a dry hillside.

3. **Aphelonotus fraterculus** n. sp.

Similar to *simplus* Uhler but slightly larger and darker, the head piceous brown. Head about one-fourth longer than broad (30:23), the postocular part shorter than width of vertex (5:13). Eyes blackish, slightly longer and deeper than in *simplus*. Ocelli wide apart, the distance between them twice as great as the distance from an ocellus to the eye of the same side. Antennal proportion, 12:25:22:20:22. Pronotum as in *simplus*, length: width = 58:30. Membrane reaching slightly beyond tip of abdomen. Legs as in *simplus*, the anterior femora proportionally larger; posterior femora armed beneath at apical third with two short piceous, spine-like teeth. Male claspers distinctly longer and slenderer than in *simplus* (fig. 2), when in repose the apex of one distinctly overreaching the base of the other. Length, 4.0 mm.; width, 1.25 mm.

Holotype, male, Rio Trinidad, Panama, June 9, 1912, A. Busck, collector; *allotype,* female, Ancon, Canal Zone, Panama, May 12, 1911, A. H. Jennings, taken at arc-light; both in collection of U. S. National Museum. *Paratypes,* one male and one female, taken with allotype, one female, Tabernilla, Canal Zone, Panama, May, 1907, Aug. Busck, collector; one male, Rio Trinidad, Panama, March 20, 1912, A. Busck, collector; and two females, F. Campos R., Guayaquil, Ecuador; in collection of the U. S. National Museum and of the writer.

This is perhaps the species that Champion records (and figures, l. c., Pl. XVIII, fig. 15) from Guatemala as *A. simplus* Uhler.

4. **Aphelonotus medius** n. sp.

Brownish fuscous, the head piceous, its apex, and the antennae, and tibiae paler. Head about three-fifths longer than broad (40:25), the postocular part slightly longer than width of vertex (10:8). Eyes dark reddish, proportionally larger than in *simplus*. Ocelli placed equally as far from each other as from the eyes. Antennal proportion, 16:27:25 (IV and V missing). Pronotum twice as broad as long (70:35). Scutellum without basal median groove. Clavus with a few coarse punctures; membrane extending slightly beyond apex of abdomen, with an unbranched vein extending outward from the inner apical angle of the shorter or inner cell. Legs proportionally larger than in the preceding species, the posterior femora underneath with about a half dozen slender piceous teeth along their apical halves. Male clasper distinctive (fig. 3). Length, 4.65 mm.; width, 1.4 mm.

Holotype, male, Madeira River above Manaos, Brazil, Lee Prizer, September, 1923, in collection of U. S. National Museum.

5. **Aphelonotus major** n. sp.

Similar in coloration to *medius* n. sp., the head and pronotum darker than rest of body. Head about three-fourths longer than broad (57 : 33), the postocular part distinctly longer than width of vertex (17 : 13), the latter more strongly arched than in the other species; sides of head with a distinct laterally compressed shiny area behind the eyes. Eyes reddish brown. Ocelli placed as in *medius.* Antennal proportion 20 : 45 : 36 (IV and V missing). Pronotum scarcely twice as broad as long (96 : 50), the anterior lobe with a pattern of distinct smooth, crescent-shaped lines on each side. Scutellum with a smooth lunate area on each side of basal half, the basal median depression somewhat punctate but without distinct furrow. Hemelytra extending to tip of abdomen, the corium more distinctly and coarsely punctate than in *medius,* the membrane with two unbranched veins extending outward—one from each cell (fig. 5). Legs greatly incrassate; anterior trochanters beneath with four or five stout piceous teeth; each posterior femur armed for its entire length along the anterior surface beneath with a row of piceous teeth, and also with a few teeth on the apical fourth of the posterior surface. Length, 6.8 mm.; width, 1.9 mm.

Holotype, female, Teffe, Brazil, January 28, 1920, H. S. Parish, in author's collection. *Paratype,* female, Teffe, Brazil, January 21, 1920, H. S. Parish, collector.

BIBLIOGRAPHY.

Champion, G. C. 1897–1901. Insecta Rhynchota. Hemiptera Heteroptera, II. I–XVI + 1–416, 22 pls. In Biologia Centrali-Americana. London. 1880–1909.

Harris, H. M. 1928. A Monographic Study of the Hemipterous Family Nabidae as it Occurs in North America. Entomologica Americana, IX (n. s.), pp. 1–98, Pls. I–IV.

————. 1930. Notes on Some South American Nabidae, with Descriptions of New Species (Hemiptera). Annals Carnegie Museum, XIX, no. 4, pp. 241–248.

Reuter, O. M. 1908. Bemerkungen über Nabiden nebst Beschreibung neuer Arten. Mém. Soc. Ent. Belgique, XV, pp. 87–130.

Uhler, P. R. 1894. On the Hemiptera-Heteroptera of the Island of Grenada, West Indies. Proc. Zool. Soc. London, 1894: 167–224.

Explanation of Plate I.

Fig. 1. Left genital clasper of male of *A. simplus* Uhl.
Fig. 2. Left genital clasper of male of *A. fraterculus* n. sp.
Fig. 3. Left genital clasper of male of *A. medius* n. sp.
Fig. 4. Head of *A. major* n. sp., showing nature of rostrum.
Fig. 5. Hemelytron of *A. major*, showing venation of membrane.

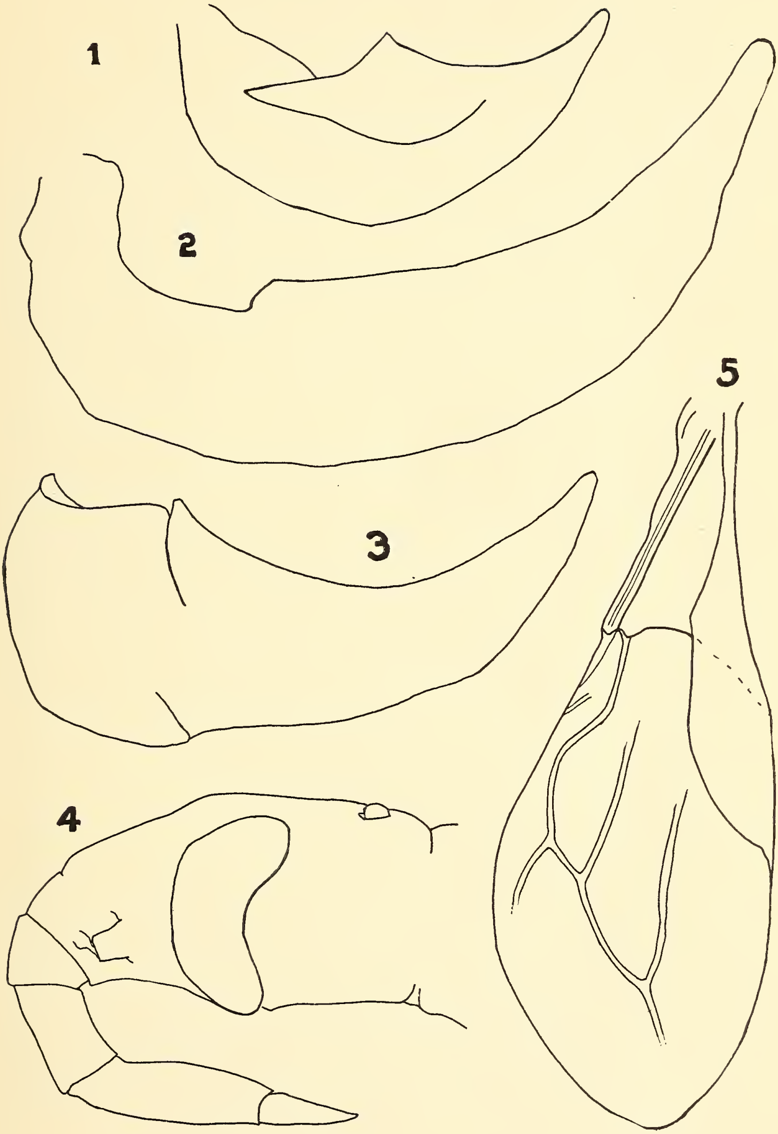
THE GIANT KATYDID (STILPNOCHLORA COULONIANA SAUSSURE) IN MONROE COUNTY, NEW YORK.

By J. Douglas Hood and Helen M. Hincher, University of Rochester, Rochester, N. Y.

One late evening in the latter part of August, 1930, Mr. William Kruse, osteologist at the University of Rochester, captured a female of this large insect at his cottage, located on Irondequoit Bay, Monroe County, New York. According to Mr. Kruse, the insect, though a female, was making a clicking noise on the screen of an open window. It seemed to be perfectly at home although Blatchley (Orthoptera of Northeastern America, p. 491) quotes Rehn as stating that this rare species is known only from Cuba, the Isle of Pines, and Florida.

The locality in which the specimen was taken is very largely unsettled, with areas of oak and chestnut woods, and is five miles from the business district of Rochester, leading one to doubt the agency of man in its transportation. The question arises as to how the insect reached a spot more than a thousand miles north of its normal range. The wings, however, are just twice the length of the body, and unusually powerful looking; and it is not beyond possibility that the specimen flew northward in the high air currents. This solution would not suggest itself, probably, but for the fact that at Rochester we frequently experience great flights of the cotton moth (*Alabama argillacea* Hübner), which come to us from the southern Atlantic states. Could not this katydid have arrived by the same high route?

Needless to add, the species is an addition to the Orthoptera known from New York.


1
2
3
4
5

CONCERNING THE EGG OF POLYSTOECHOTES PUNCTATUS FABR.* (NEUROPTERA.)

By H. B. Hungerford, University of Kanasas, Lawrence, Kans.

Professor J. H. Comstock in his splendid "Introduction to Entomology" states that there are two known species in the family Polystoechotidae, both of them from America. He says that the larva of neither of these species is known and remarks that this is a strange fact considering the size and the abundance of these insects. He does not mention the eggs or feeding habits of the adults. I find, however, that Dr. J. G. Needham in his "Aquatic Insects in the Adirondacks," New York State Museum, Bul. 47, p. 551 (1901), gives a brief description of the egg as follows: "They are chalky white in color, oblong oval in outline with the surface minutely granular." He had several females confined together and they devoured the eggs and then became cannibalistic. In 1914 Dr. Paul S. Welch published a paper in the Bulletin of the Brooklyn Entomological Society Vol. IX, No. 1, pp. 1–6 entitled, "The Early Stages in Life History of *Polystoechotes punctatus* Fabr." This paper gives information, not only concerning the egg, but about the newly hatched larva as well. Both egg and larva are figured on Pl. I, which accompanies this paper. Concerning the egg he says, "The eggs were laid singly and scattered irregularly about on the glass bottom of the breeding cage. There was no evidence that the females attempted to seal the eggs to the supporting surface. No data were secured on the number of eggs deposited by a single female. The eggs are ovoid, chalk-white, and very finely granular in surface view, agreeing with the description given by Needham. This minutely granular appearance is not at all distinct, but requires high magnification to make it apparent. Measurements showed the eggs to be quite constant in size, the length varying only from 0.92 to 0.94 mm. and the width from 0.46 to 0.54 mm. The outer egg membrane is smooth and free from irregularities.

As the time of hatching approached the eggs changed color, gradually assuming a greenish hue which ultimately developed into a distinct green color a short time previous to the emergence of the larvae. Eggs which were deposited August 1st hatched

---

* Contribution from the University of Mich. Biological Station.

August 15th, thus making an egg period of fifteen days. All of the eggs under observation developed at the same rate and all hatched within a few hours of each other.

Since neither the description of the egg nor the drawing submitted showed one interesting detail which is important, it was suggested by Dr. Welch, my colleague at the Michigan Biological Station, that this note be published.

Polystoechotes punctatus Fabr. is fairly common about the Michigan Biological Station which is located on the shore of Douglas Lake, Cheboygan County, Michigan. They appear in late July and continue through August, flying to our lights in the evening. On August 5, 1930, I captured a female that flew into the laboratory and placed her under a glass rearing jar. On August 10 I discovered 29 eggs scattered loosely about on the bottom of the cage. By August 20 she had deposited 92 eggs. I fed the insect living flies and caddis flies, which were dismembered and devoured at night.

The eggs are rather soft shelled and easily collapsed. While they appear chalky white to the unaided eye, under the binocular they are opalescent with a tiny chalky white button-like micropyle at one end. This characteristic reminds one somewhat of the eggs

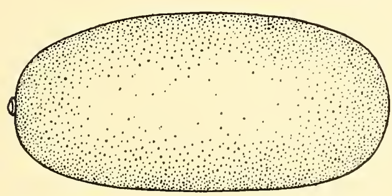


Fig. 1.

of *Chauliodes,* one of the Sialids. Although the shape of the micropyle resembles the drawings of those of Chrysopid eggs submitted by Dr. R. C. Smith in his paper on the "Biology of Chrysopidae," Cornell University Agri. Exp. Sta. Memoir 58 (1922). The eggs averaged 1.02 mm. long; the micropyle being .02 mm. long; the width .48 mm. The accompanying text figure which has been drawn for me by Dr. Kathleen Doering gives a proper conception of the egg of this interesting insect.

ON THE VALIDITY OF GLISCHROCHILUS QUADRISIGNATUS SAY.

(Coleoptera, Nitidulidae.)

By Carl Geo. Siepmann, Rahway, N. J.

INTRODUCTORY

In nearly every collection of Coleoptera one will find under the name *Glischrochilus fasciatus* (or possibly under *Ips quadriguttatus*) a complex of two equally common species which can be readily and positively separated from each other by the shape of the basal spot of the elytra. One of these species is the familiar *fasciatus*. The other is *quadrisignatus,* recognized as a valid species by Say, who described it, and by Melsheimer and by Reitter, each of whom named a variety. *Quadrisignatus* has been suppressed as a synonym of *fasciatus* by later authorities, but absolute proof of the specific distinctness of the two forms exists in,

(1) The flagellum of the male genitalia, which is of entirely different structure in the two species.

(2) The elytral tips, which vary sexually in *fasciatus,* but not in *quadrisignatus.*

Anyone, even without special knowledge of Coleoptera, can readily and positively separate the two species by the shape of the basal spot of the eltyra—there are no intermediate forms. The structural differences between the two species cannot be grasped as quickly, but are clearly recognizable, hold specifically constant over a large series of specimens, and once apparent, leave no doubt in the student's mind to which of the two species the specimen under examination is to be referred with respect to that particular character. Characters which were found to be of an indefinite nature permitting doubt to exist as to whether a specimen was one way or the other were summarily rejected, and have found no place in this paper. All of the structural characters here considered are being presented for the first time, all of those given in previous literature for the separation of these two species having been found useless.

In the preparation of this paper a large number of relaxed specimens, either in alcohol or soaked in hot water, were available for study. Every possible measure was taken to be accurate and positive. Wherever a characteristic seemed likely to prove a means of separating the two species, series of specimens were examined first with a hand lens and then with a compound microscope; males of one species were compared with males of the other, and females were compared with females. No attempt was made to compare specimens opposite both in sex and species. Sexes in all cases were determined by extracting the genitalia; species were determined by the elytral pattern. At least forty males were tentatively identified by the elytral pattern and the determination checked by examination of the flagellum of the genitalia; in every case the first determination proved reliable. More than fifty females whose sex was ascertained by examining the genitalia were tentatively identified by the shape of the basal spot and in all cases the form of the elytral tips checked up with the determination based on the elytral pattern. In no case did the shape of the basal spot result in a determination which failed to agree with that obtained by examination of the flagellum of the male genitalia, the elytral tips, or the other structural characters presented in this paper.

Wherever a character was noted which seemed likely to prove of value in separating the two species the part in question was dissected from a number of specimens and viewed from every possible angle. Several characters which at first seemed suitable for the separation of the species were rejected because they were inconstant with the respective species, and two characters (form of clypeus, and shape of hind angles of thorax) which do present some constant variation in the two species were rejected as being of doubtful value since the angle at which the part in question was viewed gave an illusion of the differences that actually existed.

All of the specimens examined for the preparation of this paper were obtained at the same locality, Avenel, New Jersey. Over a thousand specimens were available for comparison, but only two hundred specimens were actually soaked, dissected, and examined as to the genitalia.

Specimens from New York, Tennessee, Alabama, and Maine were also examined, and found to agree with the New Jersey material in all external characters, but this material was not used in the actual preparation of this paper, nor in making the drawings of the genitalia.

Both species occur in about equal numbers; they are most common about freshly decaying fruit, or moistened grain; early in the spring at sap and at carrion; rarely under stones or other cover, or on the wing. Both species occur mixed up together, sometimes one species, sometimes the other, being more abundant.

The males of *fasciatus* are more common than the females, outnumbering them about two to one, while the females are more numerous in *quadrisignatus,* outnumbering the males in about the same ratio. Unusual as this may seem, the fact is confirmed by both large and small series of specimens.

Horn, in his " Revision of the Nitidulidae of the United States " (Trans. Am. Ent. Soc. VII, 1879), followed by Blatchley, " Coleoptera of Indiana," page 649 (under *Ips quadriguttatus*) states that the tips of the male elytra are oblique, those of the female rounded.

Determination of the sexes by the genitalia shows that it is the female that has the oblique elytral tips, which are prolonged and pointed, and somewhat sinuate; the male has the elytral tips rounded. Furthermore, this applies only to *fasciatus*; in *quadrisignatus* they are the same in both sexes, squarely truncate, with rounded corners, and distinctly shorter on the sutural side.

The illustration in Blatchley's " Coleoptera of Indiana," as *Ips quadriguttatus,* represents *quadrisignatus* and not *fasciatus.*

In the following table for the separation of the species, the shape of the basal spot of the elytra (as described in *italics*) is all that is necessary for positive determination of material.

Key for Separation of Glischrochilus fasciatus and quadrisignatus.

A. *Basal spot of elytra large, trilobed, never divided, reduced, or lacking,* brilliant orange in color; apical spot directly in a line beneath the basal spot, and midway between the suture and the sides of the elytra; sinuous, as if composed of two spots closely fused together. General form of insect broad, convex, stout; thorax on the whole slightly broader than the elytra on the whole; side margins of thorax broad, but very slightly reflexed; punctuation of entire upper surface very fine; tips of elytra in female oblique, prolonged, and pointed; in male, tips transverse, rounded. *G. fasciatus* Oliv.

B. *Basal spot of elytra subrectangular, oblique, sometimes slightly lunate, partly enclosing the humerus, never trilobed; sometimes divided, reduced to one or two fine points; rarely apparently lacking;* spots pale yellowish in color, except in some small specimens with divided basal spot, where they are sometimes reddish (never orange). Apical spot small, oval, not sinuous, does not appear to be composed of two closely fused spots; not directly beneath the basal spot but conspicuously more suturad, and nearer the suture than to the outer margin of the elytra; general form of insect smaller, narrower, flatter, and more parallel than in *fasciatus*; thorax not wider than the elytra, but its sides taken together with those of the elytra make parallel lines; thoracic margins narrower but more evidently reflexed than in the preceding species; punctuation of upper surface coarser than in *fasciatus*; elytral tips similar in the sexes, truncate, distinctly shorter on the sutural side than on the outer side.

G. quadrisignatus Say.

List of Described Species and Varieties, with Synonymy.

Glischrochilus (*Nitidula*) *fasciatus* Oliv.

Antoine G. Olivier—" Entomologie II," No. 12, p. 7, Paris, 1790.

The original description is extremely short, repeating the same thing in French and in Latin. No structural characters are given which distinguish it from the other species of the genus. An illustration (Pl. 2, Fig. 13) accompanies Olivier's description. The elytra are described as being yellow, with a crossband at the middle, the apex, and the exterior basal angles black. Type locality —Georgia and the Carolinas.

The rather minute, but beautifully colored illustration, showing the large, broad, fasciate basal spots, and the description which considers the insect yellow with black stripes rather than black with yellow stripes clearly identify this species. It leaves no doubt as to which of the two species at present confused under this name *fasciatus* really refers.

The shape of the basal spot varies as follows:

(a) Usually large, broad, rounded, with the inner side of the spot parallel with the suture, not at all, or very slightly emarginate, giving the two spots together the appearance of a broad yellow crossband interrupted only at the suture. This is the typical *fasciatus*.

(b) Sometimes the basal spot is the shape of an irregular "X" with the upper outer arm missing, due to the deep emargination of the sutural margin of the spot. This results in a distinctly maculate rather than vittate form. It is the variety *4-maculosus*

Melsh. (Friedrich Melsheimer—Proc. Ac. N. S. Phila., II, p. 108, Oct., 1844.)

The two varieties of *fasciatus* merge into each other, as do most color varieties of beetles, but there is no approach to the form of the spots that occur in *quadrisignatus* and the variation in this species as noted above is the only variation present in the species. The basal spots are never divided, reduced or lacking, nor is the apical spot ever absent.

Specimens of the variety *4-maculosus* tend to be smaller in size, and are often females.

Glischrochilus (*Ips*) *quadrisignatus* Say.

Thomas Say—Desc. New N. A. Coleopt. in Bost. Journ. N. J., I, p. 169, 1835.

The original description is rather short; it includes few structural details, none of which are of the slightest value in distinguishing this species from *fasciatus*; the basal spot is described as " arcuated so as to enclose the humerus " and again as " uniformly small"; the apical spot is described as "transversely oval, not sinuated," which clearly identify the species.

The basal spot is often divided, sometimes the two parts being loosely joined; sometimes the basal spot is reduced to two minute linear points, or even to a single minute dot. The form in which the basal spot is divided or greatly reduced is the variety *similis* Melsh. (Friedrich E. Melsheimer, Proc. Ac. N. S. Phila., II, p. 108, Oct., 1844.)

Specimens sometimes occur in which the basal spot is apparently lacking, but close examination will always reveal a minute spot. In specimens in which the basal spot is greatly reduced, the apical spot is often smaller and more roundish.

Very small specimens of the variety *similis* always have the basal spot reduced to two or one small, minute, often linear points, which are sometimes reddish rather than yellow in color; these specimens are also more shining, somewhat more coarsely punctured, and have the vestiges of elytral striae a little more evident. They are almost always females, and were described by Reitter as *Ips quadrisignatus* var. *sexpustulatus* (" Syst. Eintheil, Nitid." in Verh. Nat. Vereins Brunn., XII, page 161, 1873). There is no adequate reason why this form should not be considered a synonym of the variety *similis* Melsh. *Sexpustulatus* was described from Florida.

Intermediate forms between typical *quadrisignatus* and the variety *similis* occur, but there is no variation other than that already mentioned, and the spots never approach in form those of the true *fasciatus.*

Glischrochilus (*Ips*) *bipustulatus* Melsh.

Friedrich E. Melsheimer—Proc. Ac. N. S. Phila., II, p. 108, Oct., 1844.

The original description is comparatively detailed, with several structural characters, none of which show any constancy when a large series is examined. It is supposed to differ from *quadrisignatus* by its inferior size and more quadrate contour, but it is undoubtedly a synonym of *quadrisignatus.* Described from Pennsylvania.

Glischrochilus (*Ips*) *geminatus* Melsh.

Friedrich E. Melsheimer—Proc. Ac. N. S. Phila., II, p. 108, Oct., 1844.

This species seems to be described from a single teneral specimen; the basal spot is described as composed of three roundish closely connected ones; the posterior one is composed of two oval or roundish ones. It is supposed to be more oblong than either *fasciatus, quadrisignatus, bipustulatus* and *sanguineolentus.* It is evidently a synonym of *fasciatus,* the type being possibly a female, which on account of the peculiarly produced elytral tips, would have a more oblong appearance. Described from Pennsylvania.

Glischrochilus (*Ips*) *quadriguttatus* Blatch. nec Fab.

Willis S. Blatchley—"Coleoptera of Indiana," p. 649, 1910.

This name refers to both *fasciatus* and *quadrisignatus*; a misdetermination, the true *quadriguttatus* Fab. being European. The European species of this name does not resemble either of our species in the least; it is extremely small, narrow and parallel, even more so than our *quadrisignatus*; the basal spots are quadrate, a little broader behind, not at all oblique or lunate; the apical spot is almost round and very little behind the middle. The thorax is flattened and decidedly narrowed basally, which character will readily distinguish this species from all the others mentioned in this paper.

The European *quadripunctatus,* however, comes pretty close to our *fasciatus* in general form, shape of the thorax, and shape of the spots. The basal spot is almost exactly as in the variety *4-maculosus* and the apical one is very evidently composed of two closely fused spots. This species, however, is conspicuously

smaller than our *fasciatus,* and though as convex, is much narrower.
Glischrochilus geminatus, and the varieties *4-maculosus* and *similis,* all described by Melsheimer were omitted from the Leng Check List.

Impressions on Head.

According to Reitter, in a footnote to his description of *Glischrochilus quadrisignatus* var. *sexpustulatus,* loc. cit., there are four small impressions on the head of *quadrisignatus,* arranged in a transverse row, whereas in *fasciatus* there are only two, the inner ones being absent.

The inner impressions of the head vary from altogether absent to quite distinct, and are usually broad, shallow and very vague. They are difficult to see if the light does not strike the head at just the proper angle, and cannot be distinguished at all if the specimen is dusty. They seem to be more regularly present in *quadrisignatus* than in *fasciatus,* and when absent can be supplemented by a very slight exercise of the imagination. I was misled at first, believing that the number of impressions on the head presented a constant character for the separation of the two species, but the examination of a large series of specimens shows the character to have no specific constancy. There are at hand some perfectly clean specimens of *quadrisignatus* which show absolutely no trace of the inner depressions on the head, no matter in what light the specimen is held, as well as a number of specimens of *fasciatus* which show them as clearly as any *quadrisignatus.* Furthermore, the specimen which shows these impressions most distinctly happens to be a *fasciatus* and not a *quadrisignatus,* the specimen in question being a male from Millinocket, Maine.

Genitalia.

Males can be distinguished from females in both species in that the outer portion of the genitalia (Fig. 3) usually projects beyond the apex of the last abdominal segment through the anal orifice. The projecting part is broadly rounded and densely pubescent at the tip. It appears to be an additional (sixth) abdominal segment, but removal of the piece in question, and close examination of its structure would not lead anyone to identify it as such. As a means of determining the sex of a given individual it is of doubtful value, since it might be retracted entirely within the abdomen, and thus be invisible from the outside.

The genitalia of the female (Fig. 6) do not present any specific variations, and vary individually even more so than the male genitalia. Superficially the female genitalia are very similar in the rest of the Nitidulidae, and in certain other families, including Elateridae.

In *quadrisignatus,* which is figured, the transverse terminal pieces are usually each as long as the two longitudinal pieces together are wide, whereas in *fasciatus* each terminal piece is about as long as one of the basal pieces is wide, but this character is variable, and cannot be used for the separation of the species. *Fasciatus* usually has the bulbous fleshy part at the base of the female genitalia more inflated but this likewise presents no adequate specific distinction.

The genitalia of the male consist of a large outer portion bearing a short strut (Fig. 3), the basal piece (Fig. 1) with an opening at the bottom through which slides the median lobe (Fig. 2), an elongate piece with a long terminal strut, and bearing a long, white, opaque, non-chitinized, gut-like internal sac (not figured), the proximal end of which contains a minute, hard, chitinized body, the flagellum (Figs. 4 and 5.).

An illustration and description of the male genitalia of *Glischrochilus japonica* have been published by Sharp and Muir in Tr. Ent. Soc. London, 1912, in a paper entitled, " The Comparative Anatomy of the Male Genital Tube in Coleoptera."

An illustration and description of the male genitalia of *Glischrochilus obtusus* together with a description of the genitalia of a species identified as *fasciatus* have been published by J. W. Wilson in the Annals of the Ent. Soc. of Amer., Vol. XXIII, June 1930, in a paper entitled, "The Genitalia and Wing Venation of Cucujidae and Related Families."

Both of these illustrations were prepared for purposes of comparative morphology, and not for the separation of species. There is nothing in Wilson's description of the genitalia of *fasciatus* by which to tell whether it is the true *fasciatus* or *quadrisignatus.*

Both authors illustrate the genitalia with but one figure, a side view of the median lobe, with the attached internal sac, swinging through the opening in the basal piece. The flagellum is not shown in the illustration of either species, probably because it is lacking in both *obtusus* and *japonicus*; neither is the outer portion of the genitalia shown, represented in Fig. 3 of this paper.

The male genitalia of *quadrisignatus* and *faciatus* do not vary in the form of the outer portion, the basal piece, or the median lobe (Figs. 1 to 3).

Wilson gives adequate differences between the genitalia of *obtusus* and *fasciatus* on pages 324–325 of the paper already mentioned, the chief of which are that in *obtusus* the internal sac is enlarged to form a bulb-like structure at the proximal end, whereas this is not the case in *fasciatus,* and that the latter species contains a flagellum at the proximal end of the internal sac, which is not present in *obtusus.*

In other respects the median lobe and basal piece of *obtusus* and *japonicus* are very similar to those parts in *fasciatus* and *quadrisignatus,* the differences being only a matter of comparative proportions.

Outer Portion of Genitalia (Fig. 3): May be mistaken for an additional 6th abdominal segment; consists of a large, broad, chitinized portion, flat but very concave, with broad, reflexed margins on the inner side. The inside is filled with fleshy matter, and a short, stiff, chitinized strut projects from it. The distal end is broad, rounded, and bears numerous setae. This portion of the genitalia is not connected with the remaining portions.

Basal Piece (Fig. 1): Chitinized, convex, curved when viewed from the side, rather elongate, truncate and setose at the distal end, proximal end flattened, Y-shaped, with a large opening through which the median lobe swings.

Median Lobe (Fig. 2): Heavily chitinized, convex, solid, curved when viewed from the side; slides through the opening at the proximal end of the basal piece, the convex part of the median lobe fitting against the concave side of the basal piece. The median lobe bears a long, stiff, chitinized median strut, thickened at the end. This strut is really composed of two closely applied pieces which can be forced apart. The illustrations by Sharp and Muir, and by Wilson do not show the double nature of this strut. Four poorly defined lobes project through the dorsal surface near the distal end; they are closely fused together and to the remainder of the median lobe, and barely project above its surface. The more distal of the four are smaller, and project beyond the tip of the median lobe as two minute points. At each side of the median strut, near the base, there are two short, chitinized, flattened, curved, ribbon-shaped pieces, more or less obscured by the membranous tissue of the internal sac.

Internal Sac: A long, fleshy, non-chitinized, gut-like portion, extending from the base of the median lobe parallel with and for about the length of the medial strut. This organ is figured in the illustrations of Sharp and Muir and of Wilson, but not in this paper, it being beyond the scope of the subject in hand to consider the fleshy anatomy of the insects.

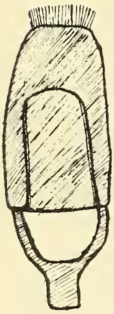
Flagellum (Figs. 4 and 5): The flagellum is present in a number of isolated genera of Coleoptera and usually exists as a fine, whip-like organ at the proximal end of the internal sac. According to Wilson, it is not present in *G. obtusus,* but he says of *fasciatus,* "Internal sac with a large irregular structure at the proximal end, the flagellum. This flagellum almost completely fills the internal sac."

The flagellum is the only part of the genitalia that varies specifically in *fasciatus* and *quadrisignatus,* the differences being not a mere matter of comparative lengths and widths, but a total difference in structure. There is no need of detailed description, the illustrations, Fig 4 representing *fasciatus,* and Fig. 5 representing *quadrisignatus* doing full justice to this organ.

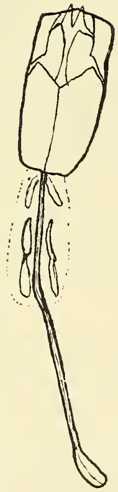
Whether this organ, which remarkably resembles complete genitalia of the form present in the males of certain families of Coleoptera, is a true "flagellum" or not is somewhat doubtful, though it is so named by Wilson, who seems to be the only student to have discovered it. The flagellum in other Coleoptera is whip shaped, and very simple in structure.

The flagellum, on account of its minute size may possibly be overlooked when examining the genitalia, or may even be broken off together with some of the internal sac when they are pulled out. It can be recognized as a darker spot at the proximal end of the internal sac, opposite the inflated tips of the median strut. The use of a little potassium hydroxide causes it to darken a little in color, and assists in removing the fleshy portions of the internal sac which obscure its visibility. All these fleshy parts must be picked away with a pin before the flagellum can be studied in detail, but in a moistened specimen the form of this organ can usually be made out sufficiently to determine whether it is of the *fasciatus* or the *quadrisignatus* type.

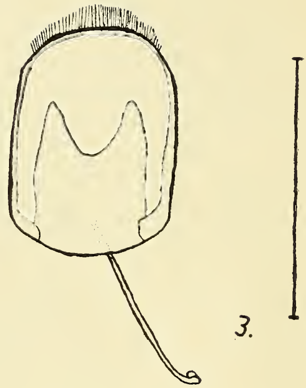
When the flagellum of *fasciatus* is viewed endwise, the extremities of four broad outer lobes are seen. When the same part of *quadrisignatus* is viewed from the end, one looks into a hollow



1.

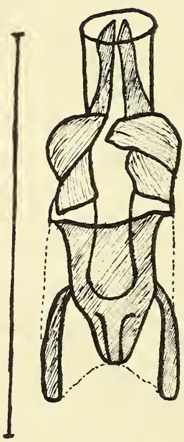


2.

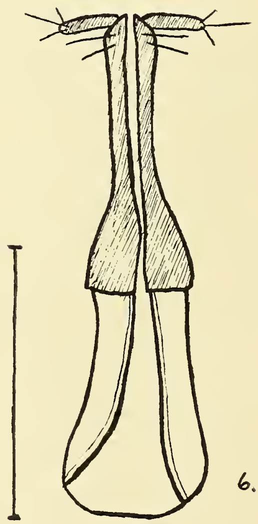


3.

4.



5.



6.

funnel, from the inside of which two sharp points project. There are four lateral lobes on the flagellum of *fasciatus;* only *two* on that of *quadrisignatus.*

The dotted lines on the illustration of the flagellum of *quadrisignata* represent the membranous material which envelopes the entire lower half of that organ and holds it together.

Explanation of Plate II.

Fig. 1. Basal piece, dorsal view (*G. quadrisignatus,* male).
Fig. 2. Median lobe, dorsal view (*G. quadrisignatus,* male).
Fig. 3. Outer portion of genitalia (*G. quadrisignatus,* male).
Fig. 4. Flagellum (*G. fasciatus,* male).
Fig. 5. Flagellum (*G. quadrisignatus,* male).
Fig. 6. Genitalia of female (*G. quadrisignatus*).
Line to the right of Figures 1 to 3 represents one millimeter.
Lines to the left of Figures 4, 5 and 6 represents one-half millimeter.

Sphecius speciosus Drury.—On the 2nd day of August, 1930, at Robbinsville, N. C., over thirty specimens of this insect were seen, thirteen females and seven males being collected. They were chasing each other three and four at a time, then came to rest on leaves of blackberry briars. The following day I returned and spaded out the burrow of a large female, which I found in the brood chamber. She was placed in a glass jar where I was trying to get her to lay some eggs, but to my surprise she stung herself and died. This is my first observation on insect suicide.—S. B. Denton, Robbinsville, N. C.

Ischalia costata Lec.—Although this beetle has been recorded from widely separated localities, I have never seen a live specimen but once. One was taken in Sherborn, Mass., on June 17, 1930, while sifting leaves taken from beside a large fallen limb near the edge of a woods of heavy growth.—C. A. Frost, Framingham, Mass.

DACOTA HESPERIA UHLER REFERRED TO ATRACTOTOMUS, ALSO DESCRIPTIONS OF THREE NEW SPECIES (HEMIPTERA, MIRIDAE).*

By Harry H. Knight, Ames, Iowa.

Atractotomus hesperius (Uhler) n. comb.

1872 *Dacota hesperia* Uhler, Hayden's Surv. Terr., Rept. for 1871, p. 413.

This species was originally described as type of the genus *Dacota* Uhler, and as such has remained an enigma to later Hemiptera workers until the present time. From a study of the description alone the writer at one time thought *hesperia* Uhler might refer to the genus *Polymerus* Hahn, due to the character of the pubescence. Later, in 1921, I first recognized the species among material collected by Mr. A. A. Nichol in Yellowstone National Park, Wyoming. In the year 1926, while spending some time working at the U. S. National Museum, I located the type of *Dacota hesperia* Uhler and thus was able to confirm my earlier determination of the species. I am unable to satisfactorily separate *Dacota hesperia* Uhler from the genus *Atractotomus* Fieber (1858), therefore place it as a synonym.

Atractotomus hesperius (Uhler) has the second antennal segment thickened as is typical for the genus; body clothed with silvery sericeous pubescence and intermixed with simple dark hairs; color uniformly black, moderately shining, legs dark orange red, tarsi and tips of tibiae black.

♀. Length 4.3 mm., width 2 mm. Head: width .91 mm., vertex .52 mm. Rostrum: length 1.8 mm., attaining hind margins of posterior coxae. Antennae: segment I, length .30 mm., thickness .13 mm.; II, 1.34 mm., greatest thickness .15 mm., moderately fusiform; III, .78 mm., slender; IV, .41 mm.; black. Pronotum: length .75 mm., width at base 1.43 mm.

Records: 2♀, July 20, 1920, Yellowstone National Park, Wyoming (A. A. Nichol). 4♀, July 20, 1898, Little Beaver, near Fort Collins, Colorado (E. D. Ball); specimens not mounted and studied until 1928. ♀, August, 1924, Pingree Park, Colorado (Beamer & Lawson).

---

* Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

Atractotomus reuteri n. n.

A new name proposed for *Atractotomus hesperius* Reuter (Acta Soc. Sci. Fenn., xxxvi, No. 2, p. 78, 1909) which is preoccupied in the genus by *hesperius* Uhler (1872). This change is made necessary by the above synonymy.

Atractotomus crataegi n. sp.

Allied to *mali* (Meyer) but size smaller, second antennal segment shorter and more slender, scale-like pubescence silvery white and with individual scales broader, tibiae black.

♂. Length 2.6 mm., width 1.34 mm.; form ovate, robust. Head: width .69 mm., vertex .35 mm. Rostrum: length 1.12 mm., nearly attaining hind margins of posterior coxae. Antennae: segment I, length .19 mm., thickness .06 mm., more slender at base; II, .60 mm., thickness .09 mm., slightly fusiform, length not equal to width of head; III, .39 mm., slender, dusky yellow; IV, .30 mm., dusky. Pronotum: length .54 mm., width at base 1.06 mm.

Color uniformly black, moderately shining, tarsi pale to dusky, eyes, posterior tibial knees and wing joints showing reddish; ostiolar peritreme black. Membrane blackish, vein around tip of areoles reddish. Clothed with fine, dusky, simple pubescence and intermixed with prominent, appressed, silvery-white scales on dorsum and sides of body.

♀. Length 2.8 mm., width 1.4 mm. Head: width .71 mm., vertex .37 mm. Antennae: segment I, length .19 mm.; II, .67 mm.; III, .45 mm.; IV, .26 mm.; form and color similar to the male. Pronotum: length .56 mm., width at base 1.08 mm. Form, color and pubescence very similar to the male.

Holotype: ♂, July 16, 1929, Ames, Iowa (H. H. Knight); Iowa State College collection. *Allotype:* taken with the type on *Crataegus*. *Paratypes:* ♂, June 29; ♀, July 18, 1927; 3♂ 1♀, July 2, 1928; 2♂, June 24; ♂ 2♀, July 11, 1929; 6♂♀, June 24, 1930, Ames, Iowa (H. H. Knight); all taken on *Crataegus* which is the host plant. ♂, June 25, 1927, Ames, Iowa (H. G. Johnston).

Atractotomus cercocarpi n. sp.

Form, color and pubescence very similar to *reuteri*, but distinguished by the more slender second antennal segment.

♂. Length 3 mm., width 1.5 mm. Head: width .86 mm., vertex .44 mm. Rostrum: length 1.17 mm., reaching to middle of hind coxae. Antennae: segment I, length .21 mm., thickness .086 mm.; II, .69 mm., thickness .09 mm., more slender on basal half; III, .32 mm., slender; IV, .28 mm.; uniformly black. Pronotum: length .60 mm., width at base 1.21 mm.

Color uniformly black, moderately shining, ostiolar peritreme white, tarsi brownish black. Membrane brownish black, veins somewhat paler. Dorsum, sides of body, head and femora thickly clothed with silvery white, scale-like pubescence; also intermixed with fine, dusky to blackish simple pubescence.

♀. Length 3 mm., width 1.64 mm. Head: width .91 mm., vertex .49 mm. Antennae: segment I, length .21 mm., thickness .10 mm.; II, .69 mm., thickness .11 mm.; III, .35 mm.; IV, .28 mm. Pronotum: length .62 mm., width at base 1.3 mm. Very similar to the male in coloration and pubescence.

Holotype: ♂, August 7, 1925, alt. 8500 ft., above Stonewall, near Trinidad, Colorado (H. H. Knight); author's collection. *Allotype:* taken with the type. *Paratypes:* ♂, taken with the types on Mountain mahogany (*Cercocarpus parvifolius*). 4♂♀, July 22, 1928, Raton, New Mexico (A. A. Nichol).

Atractotomus balli n. sp.

Allied to *reuteri* but second antennal segment shorter and not so thick; head and sides of thorax more thickly covered with scale-like pubescence.

♀. Length 2.6 mm., width 1.34 mm. Head: width .91 mm., vertex .52 mm. Rostrum: length .95 mm., reaching to near hind margins of middle coxae. Antennae: segment I, length .19 mm., thickness .10 mm.; II, .47 mm., thickness .13 mm., fusiform, length not equal to width of vertex; III, broken. Pronotum: length .52 mm., width at base 1.04 mm.

Color uniformly black, the ostiolar peritreme included; membrane more fuscous outside the areoles; dorsum very slightly shining.

Pubescence composed of closely appressed, silvery-white scales, and set more thickly on head and sides of thorax where the surface is completely covered; coxae and femora also bearing many scales; the whole surface intermixed with fine, dusky simple pubescence.

Holotype: ♀, May 12, 1929, Tucson, Arizona (E. D. Ball); author's collection.

PARNASSIUS OF THE WORLD.*

By William Eisenhardt, Brooklyn, N. Y.

Parnassians form that group of Lepidoptera which are chosen by collectors more than any other kind, because they are interesting. They are mountain flyers only and appear at 4000 feet and from there upwards; and one species, *P. charltonius,* from Asia, has been caught as high as 20,000 feet. They are also pretty butterflies with their very thin almost transparent wings with black and red spots and dots. A great peculiarity of this group is that you can hardly find two specimens of the same species which are exactly alike. The same species found in different localities will show a different number of spots and dots and for that reason we have an enormous number of variations, all listed with different names. Years ago it was a standing joke that a Parnassius was the best seller for any dealer in Lepidoptera because for every specimen found with an extra dot or spot, he could get an extra dollar; and I believe that there was more truth than fiction in this statement.

It is not more than fifteen years ago that Professor Dr. Seitz and Otto Bang-Haas, owner of the firm of Dr. Staudinger and Bang-Haas in Dresden, Germany, set to work to bring some light and order into the group of Parnassians with the result that today there are listed in the palaearctic regions 27 valid species with 255 sub-species or local variations and about 177 aberrations. Here in North America we have 4 species with 7 variations, three of which are also found in the palaearctic zone. They are *P. eversmanni, clodius* and *nomion.* Of these 27 species I have here 16 with 76 subspecies and 7 aberrations which I want to bring to your closer attention.

The Parnassians belong the family of Papilionidae, because of the fact that the internal vein of the hind wings is missing, which is characteristic of all papilionine genera. The name *Parnassius* was derived from Mt. Parnassus in Greece which was sacred to the god Apollo and the first butterfly of this group was described by Linné in 1758 under the name of *Parnassius apollo.* When I come to the species *"apollo"* I will add a few more words regarding this type of Linné which is still in existence.

---

* This paper, illustrated by specimens, was presented at the meeting of the Brooklyn Entomological Society, November 13, 1930.

The Parnassians, we observe, are butterflies of medium size, with more or less diaphanous wings, generally white or yellow in color, marked with black spots and round pink and yellow spots, margined with black. The head is relatively small, thickly clothed with hair. The caterpillars have very small heads. They are flattened, having a somewhat leech-like appearance; are black or dark brown in color; marked with numerous light spots. They mainly feed on *Sedum* or stonecrop, *Saxifraga* or saxifrage, *Sempervivum* or houseleek, and *Corydalis.* The chrysalis is short and rounded at the head. Pupation takes place on the surface of the ground among leaves and litter, a few loose threads of silk being spun at the place where transformation occurs.

As said before, the Parnassians are mountain flyers and we find them, with the exception of Great Britain, in all the low and high mountain regions of Europe and Asia, mainly in Siberia, also here in North America.

The authors of older works on Lepidoptera all start the genus *Parnassius* with species "Apollo," because the first *Parnassius* to our knowledge was an "*apollo.*" In the last ten years, however, they have been re-arranged and in the same way as our true Papilios have been put into 46 distinct groups, but Otto Bang-Haas has arranged the Parnassians into seven groups beginning with the *mnemosyne* group to which belong 2 species *mnemosyne* and *stubbendorfii.* I have here seven representatives of *mnemosyne* and three of *stubbendorfii.* While the former flies in Europe and Asia, the latter comes from Asia.

We find the typical *mnemosyne* in the Hartz Mountains in middle Germany and its local variation, *ariovistus,* in Würtemberg; and *hartmanni* in Bavaria. A dark aberration of the latter, var. *melaina,* is found in Austria. In Sicily we find *nebradensis*; *pyrenaica* in France; *craspedontis* in Ukrainia and Russia; and *gigantea* in China. Now this is all the same *mnemosyne,* flying in different localities; and yet there are not two among them which are exactly alike. This holds good of all the local variations or subspecies of the seven groups of *Parnassius.*

The typical *stubbendorfii* come from the Altai mountains, in Siberia, the var. *citrinarius* from Japan and *nankingi* from China. The next is the *clarius* group with 4 species: *clarius, eversmanni, clodius,* and *nordmanni.* *Clarius* and *nordmanni* are not represented in my collection. Of *clarius* we have only the typical form and 2 aberrations. It is found in the Altai Mountains, Siberia and flies at 5000 feet. *Nordmanni* and its var. *minima* represent the smallest *Parnassius* we have; and it is found in the Caucasus Mountains in Russia, flying at 14,000 feet. *Eversmanni,* a very pretty *Parnassius* and also quite rare, is found in Central Siberia, and in North America, in Alaska. *Clodius* is found in the mountains of California, Oregon and Washington.

Now we come to the third, the Apollo group, with 10 species, the first of which is *delius* and the typical form is found in the Tyrolean Alps; its var. *expectatus* comes from Switzerland and *fortuna* from Siberia. The latter has a female form and ab. *nigricans. Bremeri* flying in the Province of Amur, Siberia, was formerly listed as a subspeices of *delius,* but is now considered a distinct species. It is not represented here. The next one is *apollo,* which has by far the largest number of subspecies and aberrations, in fact, so many that it was found necessary to subdivide the apollos again into 12 distinct races by localities. Before we go into these 12 local subdivisions, I would like to say a few more words about the first *apollo.* This was a large sized female, caught in Upland, Sweden, Scandinavia, and came into possession of Linné between the years 1728 and 1734. It was mentioned by him for the first time in 1736 and again in 1741, but it was not described by him under the name of *Parnassius apollo* until 1758. This type of all the Parnassians is still in existence in the collection of the Linnean Society at the Burlington House in London. I have a very good reproduction of this Parnassius. Today, 200 years later, we find the same species in Upland listed under the Scandinavian race as *Parnassius apollo linnaei* or *apollo* verus —the true *apollo.* Now we come to the 12 apollo races by localities:

1. Germany, represented by the typical *apollo* and 4 subspecies: *bartholomaeus, bajuvaricus, thiemo* and *vinningensis.*
2. Austria, with North Tyrol represented by *cetius* and *wenzeli.*
3. Moravia and the Carpathian Mts.: by *carpathicus.*
4. Balkan States: by *omotimoius.*
5. Switzerland: by *nivatus, rhaeticus* and *valesiacus.*

6a. Italy and South Tyrol: by *rubidus.*
6b. Italy and Central Mediterranean: by *siciliae.*

7. France: by *provincialis.*
8. Spain: not represented.

9. Scandinavia-Russia: by *linnaei, scandinavica* and *uralicus.*
10. Caucasus-Asia Minor—Not represented.
11. Russian Asia—by *merzbacheri.*

And in addition a German aberration—*excelsior.*

These twenty are all *apollos,* from different localities, but no two are alike.

The next species is *honrathi,* also an Asiatic Parnassius, but not represented in my collection.

Then we have *apollonius* with 3 variations represented. The typical species flies in Switzerland, an ab. *flavomaculata* is found in Turkestan, West Asia, and both *narynus* and *gloriosus* come from Naryn in Siberia. *Nomion* is the next species. The typical form comes from the Altai Mountains in Siberia, while the American *nomion* is found in Alaska and also in California. The var. *nominulus* flies in Siberia and so does *titan.*

The next species is *discobolus.* The typical form from Siberia, the var. *griseldis* and *romanovi* from Turkestan, West Asia and *insignis* from Siberia. *Actius* is the next species. The typical form is found in Naryn, Siberia, and so is the var. *caesar,* while *minuta* comes from West Asia and flies at 10,000 feet.

Now we come to the species *jacquemonti.* The typical form from Kashmir, East India, and its var. *mercurius* from China, as also the var. *actinoboloides* flying at 12,000 feet.

The last species of the apollo group is *epaphus.* The typical form not represented, is found in Thibet, Asia, and its var. *cachemiriensis* comes from the northwestern part of the Himalaya Mountains and so does the var. *hillensis,* while *phariensis* comes from the central part of the Himalaya Mountains and while I do not have the varieties I will mention that two of them are found on Mt. Everest, *himalayanus* flying at 14 to 17,000 feet, and *everestis* flying on the Rongbuck Glacier, at 18,500 feet.

The next or fourth group is the *acco* group with 3 species—*acco, simo* and *tenedius. Acco* is from Thibet, and the rare form of *simo,* also from Thibet at 16,000 feet, are not in my collection. Its var. *simonius* comes from Turkestan, West Asia, flies at 12 to 15,000 feet and is very wild and hard to catch. Var. *kozloffi* comes from Amdo, E. India and var. *boedromius* from Siberia.

Simo has one peculiarity. It is the only species with the wide open copulatory pouch missing. While in all other species the female is easily distinguished from the male by this pouch, in *simo,* it is hard to know the difference between the sexes. However, the body of the male is tubular, bent downwards, while the female body is barrel shaped.

The typical form of the species *tenedius* comes from the Altai Mountains in Siberia and flies at 5 to 7000 feet.

The fifth group is *Tadumia.* Moore gave this name to the species belonging to this group, instead of *Parnassius,* including four species, *delphius, stoliczkanus, acdestis* and *imperator. Stoliczkanus* was formerly listed as subspecies of *delphius.* It was found to be a true species, however; it flies in Ladak, Siberia, at 18,000 feet. It is not represented here; neither is *acdestis,* which comes from Amdo, East India. Of the species *delphius* I have represented quite a number of subspecies and aberrations.

The typical form is found in Turkestan, West Asia, and its var. *intermedia* in Siberia, also the var. *albulus. Delphius* has a great many aberrations. We have four of them here, *boettcheri,* and *diaphana* from Naryn, Siberia, and the almost black ab. *styx* from Turkestan, West Asia and *satanas* from Siberia. Other subspecies of *delphius* are *infernalis* and *illustris,* both from Fergana, West Asia, *cardinalis* from Manchuria, East Asia, and *manaievi* from Ladak, Siberia. The last species of this group is *imperator,* one of the rarest of the Parnassians. The typical form comes from Thibet, and contrary to the rule that in Lepidoptera the female is always the hardest to get, in this case it is the male that is by far the rarest. It is estimated that the ratio is 1 male to 250 females caught. This is probably due to the fact that the male is very wild and restless while the females are lazy and therefore easier to catch. Its subspecies *regulus* flies in China, at 10,000 feet.

The sixth group is the Hardwickii group with 3 species: *hardwickii, szechenyi* and *orleansi.* The typical form *hardwickii* comes from Simla, East India. Besides the latter I have here a subspecies which as yet has not been named. It was caught near Gartok, East India, which is in the western part of the Himalaya Mountains flying at 15,000 feet. *Hardwickii* is the only Parnassius species, as far as it is known today, which has at least two and probably more generations. The spring generation differs from the fall generation.

The next species is *szechenyi,* and the typical form flies in China, 10,500 feet and so does its subspecies *frivaldskyi.* Of the third species *orleansi,* the typical form is not represented, only its subspecies *bourboni,* which comes from China and flies at 10 to 12,000 feet.

The seventh or last group is called *Kailasius,* which has only one species *charltonius* and Moore used the name *Kailasius* instead of Parnassius. *Charltonius* is a very pretty Parnassius from China, together with *acco* and *simo* at an altitude of 15 to 20,000 feet. The typical form is not represented; its var. *bryki* comes from Thibet, at 16,000 feet and aberration *deckerti* from Kashmir, East India, at 12 to 15,000 feet.

This ends the palaeartic Parnassius.

It will be noticed that five or six subspecies in this collection are marked co-type. This means that these specimens have also been taken into consideration in the description of a new type. There is only one more species of *Parnassius* which needs to be mentioned and that is our *smintheus* and its var. *nanus* found at high elevations in the mountains from Colorado to California and from New Mexico to Montana. I have a good many examples here and I dare say that if they were flying in Europe, each pair would have one additional name as a subspecies or an aberration.

I trust that my rather limited selection and discussion of specimens will have served its purpose—to give a general idea of the "Parnassius of the World."

Vespula maculata and Apis mellifica.—Robbinsville, N. C., October 4, 1929. To-day I saw a female *Vespula maculata* Linn. pounce upon a worker *Apis mellifica* Linn. After stinging it several times between the segments and biting it severely the hornet carried it away to devour at leisure.—S. B. DENTON, Robbinsville, N. C.

POSITION OF STREPSIPTERA ON HOSTS. III.

By Charles Robertson, Carlinville, Illinois.

The first paper, Bees and Strepsiptera, is in this Journal, XIII: 83–5, 1918; the second, Position of Strepsiptera on Hosts, is in XXV: 96–7, 1930.

Salt and Bequaert, XXV: 296–7, publish an article in reply to my second paper. My note referred to Salt's paper of 1927, and had nothing to do with the paper of the postcript, except the crediting of the observations on *Polistes* and Eumenidae to Salt. The case of *Odynerus ziziae* MS. was only to show that they had seen the paper. What they call "our critic" should be Salt's critic. After ignoring Rosenhauer and Perez, it was quite consistent for Salt to ignore my first paper.

As far as the literature shows, the condition in *Andrena* should have been credited to Perez, 1886, that in *Chloralictus, Pseudopanurgus* and in short-tongued bees in general, to my paper of 1918.

The condition in *Polistes* should have been credited to Rosenhauer, 1842, that in Eumenidae to my paper of 1918, while the fact that the set under segment 3 consists of females and the one under 4 of males should have been credited to Bequaert. All of the other records are second-hand.

The authors say it is a ticklish business to claim priority. Ignoring previous work involves such claim. It is only a step from ignoring the literature to claiming priority or crediting it to one who does so, as is shown in crediting the observation of the conditions in *Polistes* and *Odynerus* to Salt. A master of research cites the literature as far as he knows it. Those who affect authority and avoid citing the literature are responsible if less-informed persons and editors publish second-hand matter.

My paper of 1918 is the only one that cites any literature relating to position of the parasites, and its defects in this regard comes from relying on Pierce who was supposed to know about it. It was a good thing to prize out references to Perez and Rosenhauer.

The conditions in Eumenidae were credited to Salt in Psyche 36: 275 and to Bequaert in this Journal XXV: 227. The authors quote my statement about *Odynerus* and imply that it is worthless because it relates only to the position of the parasites.

They say that their critic's observations on *Polistes* are no more new than their own. The difference is between third-hand and fourth-hand. What they call " our critic's observations on *Polistes*" consisted merely of a tabulation of Pierce's data on *P. annularis.* This has been stated twice. It showed that what Pierce called basal was middle.

Salt and Bequaert claim that a confirmation or verification of a determination justifies one in taking credit for it. The use of " det." is a fraud when it implies that the determination was not made before. They say that the species are readily recognizable. It is ten times harder to identify a species by comparing with a long list of descriptions than to verify the determination by comparing with the single description.

It appears that the label of *L. foraminatus* was not removed by Salt, but he was responsible for it because the specimens were entrusted to his care. They were not loaned to any " partnership." The specimens should have been sent directly to the Museum of Comparative Zoology.

A partnership is quite elusive, consisting of one, the other and both. It is ticklish business criticizing one because the other is sure to be to blame.

Donacia liebecki Schaeffer.—The first time this insect has fallen into my hands occurred on July 5, 1930, while collecting with Dr. J. P. Bill at a small pond in Dennis, Mass. Two or three specimens were taken from the flowers of the yellow pond lily, *Nuphar advena* Ait.—C. A. Frost, Framingham, Mass.

BOOK NOTES.

A History of Applied Entomology (Somewhat Anecdotal), by L. O. Howard. [Pp. i–viii + 1–545, with 51 plates (of portraits), Smithsonian Miscellaneous Collections, vol. 84 (whole volume), publication 3065. Smithsonian Institution, Washington, D. C.—$2.25.]

Here are the swift-moving recollections of more than fifty years of life in the service of the United States, since that November in 1878, when, under Riley, the then young Howard first appeared on the scene. Dr. Howard's life work has coincided with the formative period of world-wide economic entomology. We have in this book nothing less than a procession of personages, most of them known personally to him. Needless to say, the form in which the work is cast (" somewhat anecdotal ") does far more to make alive these long-gone leaders than would the more formal narrative of an exact historical method. We see in these pages these leaders as they were and are—gifted men of lovable human traits—and sometimes not so lovable. Nevertheless, they were men of character, aspirations and accomplishments.

Not alone do the American makers of economic entomology and their achievements file through these pages in a pageant of progress but also their contemporaries from every region. We see before us the great American leaders—Harris, Walsh, Riley, Glover, Thomas, Fitch, Comstock, Fernald—down to their innumerable successors of today. And step by step with them march their foreign compeers—Boisduval, Costa, Rondani, Targioni-Tozetti, Marchal, Lefroy, down the years into the replete ranks of the moderns.

In this long, fascinating story, Dr. Howard himself appears only as the narrator, but every page reflects the fulness of his life and the variety and greatness of his accomplishments. Modestly effacing himself, he has drawn his own portrait of a man among men.

It is impossible to quote from this work, which literally ranges " from China to Peru "—to endeavor to do so would be to copy it in full. It is one of those few books whose great value today will increase immeasurably with the passing of the years. As a source of historical facts as seen by an eye-witness, it is of great importance in any appraisal of the progress and status of economic entomology.—J. R. T.-B.

Thomas Say: Early American Naturalist, by Harry B. Weiss and Grace M. Ziegler (Pp. i-xiv + 1–260, with 27 illustrations, mostly insert plates. Charles C. Thomas, Springfield, Ill.—$5.)

To the writer, who has always desired to know the facts about this great man, the true founder of American Entomology, this book is a godsend. Setting aside any question of literary values (which, indeed, are not absent), this is a fine presentation of the times and labors of Thomas Say. Well does Dr. Howard say in his foreword: "The fame of Thomas Say has grown with the years. Working incessantly with the mollusks and the insects, fortunate in having a novel fauna with which to deal, endowed with a genius for taxonomy . . . almost everything conspired to help him to do work which has given him a high and lasting reputation. . . . In fact, Say ranks today as the most eminent of the early American taxonomic zoologists."

The Say ancestry indicates that his line was independent-minded and non-conformist to a degree. Even the State Senator, Benjamin Say, his father, had other interests beyond the bread-and-butter side of his daily life. Benjamin Say, in 1786, was interested in steamboats; he was an early prohibitionist; he was a member of the Select Committee for the Abolition of Slavery in Pennsylvania; he wrote, in 1797, a book entitled "Spasmodic Affections of the Eyes"; and in the intervals, he contrived to amass a respectable fortune. Well do the authors say, "Dr. Benjamin Say was a man of parts." In his son Thomas, this enterprising and independent nature he inherited from his father led him into other paths, not so remunerative in coin, but infinitely more satisfying intellectually, which led him to his lasting eminence in the realm of mind.

To those of us who from time to time have to control some of Say's species, this book will prove invaluable in fixing times, places and circumstances of their descriptions, to the great good of definiteness.

No words of this or any other writer are needed to establish the greatness of our first and most eminent native-born entomologist, a man gifted with an uncanny feeling for critical characters; a man happy in his isolation, which enabled him to maintain his ideas pure from exotic and alien scientific notions; a man who was wholly objective in his studies and free from the modern subjective biases of biological schools of thought, their revelations and their dogmas. To Say, a species was something real, objective and positive; what he saw, he set down, briefly, definitely, accurately. The few Sayan species not yet recognized will in time be settled, whenever specimens are found in the region he indicates to be inhabited by his species, which specimens will surely agree in major and minor details with his descriptions.

As to the book itself, as a book it is an excellent example of the printer's art and reflects credit on the publisher. It is, indeed, an indispensable element in any entomological library that in the least degree aspires to adequateness.—J. R. T.-B.

EDITORIAL.

WHAT IS THE TYPE OF THE GENUS CIMEX LINNE?

" 198. *CIMEX.* *Rostrum* inflexum.
Antennae thorace longiores.
Alae IV, cruciato-complicatae; superioribus antice coriaceis.
Dorsum planum thorace marginato.
Pedes cusorii."

(C. Linné. Systema Naturae. Editio Decima, Reformata. P. 441. Holmiae, 1758.)

" A genotype must not *disagree* with the description of the genus, nor should a species type *disagree* with the species desc. iption. Errors may be allowed to pass, but the type of the genus or species must possess the characters named in the description."

(" Editorial Comment " in Pan-Pacific Entomologist, vol. VII, p. 96, October, 1930.)

The preceding statement has all the acceptable attributes of reasonableness; and no one, it might seem, can well dispute its logic.

Notwithstanding:

By fiat, the type of the Linnean genus *Cimex* has been fixed as *lectularius,* on the general principle that it is the " officinal " species. Or, to put it another way, the *reductio ad absurdam* has been attained by making a totally *apterous* species the type of a genus one of whose primary structural characteristics is " Alae IV, cruciato-complicatae; superioribus antice coriaceis."

This seems to be a dead issue; but it is scarcely a part of science to canonize anything just *because* it is dead. And the absurd lives forever, anyhow.

J. R. T.-B.

PROCEEDINGS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Meeting of November 13, 1930.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, November 13, 1930, at 8.20 p. m.

President Davis in the Chair and 14 members present, viz: Messrs. Anderson, Ballou, Bell, Burke, Cooper, Engelhardt, L. Lacey, Lemmer, Lerch, Schaeffer, Sheridan, Siepmann, Torre-Bueno, Wilford; and one visitor.

Minutes of the previous meeting read, corrected and approved.

Mr. Engelhardt presented the Treasurer's report and commented on the very favorable state of the finances of the Society, comparing the total transactions of the Society in the year 1928, when they amounted to $2,842.13, with the total so far for this year of $2,742.18; with two months still to go it is expected that they will exceed all previous records. 1931 promises to be still more favorable. Orders are coming in from all over the world for sets of the Bulletin and *Entomologica Americana,* part of the orders being contingent on the sets being complete, some of the orders have been filled as far as the volumes on hand permit, with the understanding that the missing parts would be furnished. It is desirable that we complete at least 50 sets as that number will be used in a short time. The early volumes of the Bulletin are held at double price but it is believed best to price the sets moderately and endeavor to make a little more than the outlay and thus keep the good-will of institutions and have them as steady subscribers. To cover the cost of reproducing the missing parts Mr. Engelhardt suggests that the amount necessary above that part of the funds of the Society that can be spared for this purpose, be raised by subscription among the members, the amounts thus subscribed by them to be repaid to them as sales are made.

Mr. Torre-Bueno said that the reprints of the old numbers would be an exact facsimile of them and not in the present style of printing the Bulletin.

Mr. Torre-Bueno moved that Mr. Engelhardt receive the thanks of the Society for his excellent report. Motion unanimously carried.

Mr. Torre-Bueno reported that the next number of the Bulletin was under way; and that volume XI of *Entomologica*

Americana would consist of a very full monograph by Dr. A. G. Böving and Dr. F. C. Craighead on certain beetle larvae, under the title of "An Illustrated Synopsis of the Principal Larval Forms of the Order Coleoptera." It will consist of about 125 line plates of the larvae and their structural details, with complete explanations. This volume will not be sold as a single volume, but only to subscribers to the whole series at the regular subscription price. There will be an extra number of reprints in excess of the usual number; a limited number of the reprints will be sold at $5.00 per copy, unbound, and $6.00 per copy, bound, in cloth; after this limited number of reprints is disposed of, the price will be advanced. It is estimated that through the subscriptions and sales of reprints the Society will at least break even, which is doing well in consideration of the special character of the publication. The outstanding accounts of the Society are in satisfactory condition, there being but about $200.00 outstanding for dues and publications.

Mr. Torre-Bueno's report was received with the thanks of the Society.

Mr. Lacey reported good collecting at Pelham. A locality at the end of the Hutchinson River Parkway, consisting of woods, fields and marshes, yielded very good results. *Colias eurytheme* Boisduval was very abundant, and other captures of note were: in *Hemiptera,* the long-winged form of *Ischnodemus falicus* Say; in *Coleoptera, Xylotrechus quadrimaculatus* Haldeman; in *Lepidoptera, Colias eurytheme* ab. *pallida* Cockerell.

Mr. Wilford reported that on August 1, 1930, between Willow Brook and Bull's Head, Staten Island, N. Y., he observed numbers of the caterpillars of *Euphydryas phaeton* Drury on the ground, which having eaten all of the leaves and the stalks of their food-plant, some were dying on the neighboring bushes, and others were feeding on other plants than their regular food-plant.

Mr. Wurster reported on his collecting in July at Eastport, Maine, where he had secured specimens of *Dryas atlantis* Edwards. Back of Silver Lake, Staten Island N. Y., he had observed large numbers of *Papilio troilus* Linnaeus. He also reported that the present fall appeared to be a very poor season for the cocoons of *Philosamia walkeri* Felder (*cynthia* auct. not Drury), while he has found large numbers of the cocoons nearly all contain parasites.

Mr. Anderson reported having done very little of collecting insects; he exhibited a few specimens in several orders which he had collected on Mt. Washington above timber-line. He had visited Mt. Washington with the principal object in view of taking photographs, and he exhibited an album containing many excellent pictures of the scenes about that region.

Mr. Siepmann reported having visited northern Maine with the intention of ascending Mt. Katahdin, but as it was a 31-mile hike from where he was staying he did not get further than the foot of the mountain. The mountain has an elevation of 5,385 feet, and as it rises from a 500-foot level it presents a very impressive appearance. He collected in the lowlands and along the trails; among the logs floating in the ponds he found large numbers of Gyrinidae. He also did some collecting in New York State, on Long Island and in New Jersey.

Mr. Lemmer reported that collecting at Lakehurst was very disappointing and that even the common species of *Catocala* were scarce. The previous Sunday evening, November 9, being the best evening he had experienced of the last nine years, and that he had hopes of a few more good evenings before the season ended. Discussion in regard to experiences in getting lost in the pine-barrens followed. Mr. Lemmer related his experience in being lost in the vicinity of Lake Hopatcong, N. J. Mr. Davis told of collecting at night in company with Mr. Sleight, who found the caterpillars of *Catocala herodias* Strecker on the top of scrub-oak.

Mr. Lerch had collected at the locality mentioned by Mr. Lacey and had found there many things of interest to him and had increased his collection.

Mr. Ballou had spent some time in New Jersey during August but did not devote much of it to collecting; what he did collect was still in the course of being mounted.

Mr. Sheridan reported that he had done but little collecting during the past summer.

Mr. Burke reported that in company with Mr. Leng, on a bird-walk at Willow Brook, Staten Island, N. Y., they had found *Ptinella quercus* Leconte, the second record for New York State for this minute species of Coleoptera, the first record being that of Mr. Notman, at Keene Valley. Mr. Davis and he visited the locality again and secured about 20 more specimens. In *Odonata* Mr. Burke reported that *Libellula vibrans* Fabricius was not observed during 1930 but was very common during 1929. While numerous

Libellula vibrans were observed last year at localities on Staten Island, in Van Cortlandt Park and in one New Jersey locality, he was unable to find any this year. *Anax longipes* Hagen was observed on Long Island. This rare *Anax* was observed again in 1930 at various Staten Island ponds.

Mr. Schaeffer reported being at Lakehurst, N. J., for a week where he found a scarcity of material.

Mr. Cooper related his experience in trying to capture small beetles by removing them from his handkerchief to the killing-bottle with a straw moistened with alcohol, the results not being as successful as he wished. Mr. Schaeffer suggested that he use a bottle equipped with a cork cut short so that it could easily be pressed out with the thumb of one hand, the cork to be tied fast to the bottle with a short piece of string, thus leaving the other hand free, of which one finger is moistened with saliva and the small beetles picked up with this and transferred to the bottle. Mr. Burke also recommended this method of securing small beetles. Mr. Cooper told of finding the beetle *Brachyrhinus ovatus* Linnaeus under a dead squirrel in his yard, in Flushing, N. Y. He found specimens of this beetle daily until there came a rainy spell lasting three days, after which no more beetles of this species were found. He also told of finding a number of large *Dermaptera* under logs in moist places.

Mr. George P. Engelhardt announced his appointment as Honorary Curator of the Department of Natural Science upon his retirement from 28 years of active service at the Brooklyn Museum, on September 1st, and his removal to 28 Club Way, Hartsdale, N. Y. He extended a cordial invitation to all members to join him in exploring the extensive fields and woodlands of his new environment.

Mr. Engelhardt then related his experiences on a collecting trip, September 15 to October 15, to the Gulf States and southwest Texas. At Birmingham, Alabama, he observed great numbers of the black-underwing moth, *Catocala viduata* Gn., six or more often resting on one tree trunk in the little park square in the heart of the city. Recalling the question of a specialist whether the moths of this group rest head up or down, he noted that out of fifty specimens counted all rested head downward with only one exception. Subsequently, early in October, while at Fort Davis, Texas, he found equally abundant a species of *Catocala* belonging to the *aspasia* group, all on cotton woods, but with very few exceptions resting with the head upwards. Reposing habits must be subject to variation. *Canna* plants in city gardens at Birmingham were being defoliated by the larva of *Calpodes ethlius* Cramer. At Mobile, Alabama, in company with his friends, Dr. van Aller and H. P. Löding, Mr. Engelhardt witnessed a flight of the beautiful butterfly, *Catopsilia philea* Linnaeus, hundreds of specimens but difficult to capture. The abundance of flowering plants and insects of all kinds during the fall in the South also was a revelation. September and October are two of the best collecting months on the Gulf coast. At San Antonio, Texas, Mr. Engelhardt succeeded in obtaining a fine series of a clear-wing moth which breeds in *Clematis,* but does not emerge until October, while all the other species of the genus hatch in June or July. It has taken him three years to unravel the life-history of this species. On an outing with Mr. Roy Quillin, well known Ornithologist of San Antonio, insect collecting on a cattle ranch in the limestone escarpment twenty miles north of the city, was spoiled by wet, chilly weather, but interesting experiences were not lacking. There were plenty of armadillos, stupid creatures which rooted under trees like pigs and allowed themselves to be approached closely. A pretty coral snake, twenty inches long, pulled out of a thicket in a clearing, whipped and threw its body about violently and twisted the end of its tail into a regular knot, so that it was difficult to tell the head from the tail. It bit and held on firmly to a stick repeatedly. Turning over a stump, a skunk posed for action, and was hastily left in undisputed possession. Mr. Engelhardt showed a number of photographs, including one of the cottage of the late O. C. Poling, at Fort Davis, Texas.

Adjourned at 10.05 p. m.

E. L. Bell,
Secretary.

Vol. XXVI APRIL, 1931 No. 2

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

BROOKLYN ENTOMOLOGICAL SOCIETY
1872

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, Editor

CARL GEO. SIEPMAN GEO. P. ENGELHARDT

Published for the Society by the
Science Press Printing Co.,
Lime and Green Sts., Lancaster, Pa.,

Price, 60 cents Subscription, $2.50 per year

Mailed July 10, 1931

Entered as second-class matter January 21, 1919, at the post office at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

CONTENTS

Bulletin of the Brooklyn Entomological Society

Published in
February, April, June, October and December of each year

Subscription price, domestic, $2.50 per year; foreign, $2.75 in advance; single copies, 60 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXVI · April, 1931 No. 2

NOTES ON LEPIDOPTERA COLLECTED IN A CONNECTICUT–RHODE ISLAND WOODLAND.

By Alexander Barrett Klots, Ithaca, N. Y.

During most of the summer of 1930 the author collected moths in a considerable area of woodland located near the town of East Killingly, Conn. Collecting was strictly limited to the woodland environment. The results are therefore interesting in two ways, as furnishing some data on the Lepidopterous population of this particular type of habitat, and as productive of new distribution records for a considerable number of species.

The Environment.

Collecting was done by means of both light and "sugaring" on the south shore of Killingly Pond, almost exactly on the Connecticut-Rhode Island border (Fig. 1). While the majority of the specimens were actually taken in Rhode Island records may safely be attributed to Connecticut also, as none of the specimens recorded was taken more than 100 feet from the State line.

Killingly Pond is roughly three-quarters of a mile long by a half a mile wide. It is fed almost entirely by subsurface springs, being entered by only two small streams, both of which are often dry. The water is thus unusually clean and cool. The pond has been considerably enlarged by a dam at the outlet, its water being used by a mill. The water level is subject to considerable fluctuation.

On all sides of the lake are woods. Those on the eastern side have been recently cut; and here much second-growth of the normal woodland trees and shrubs is struggling with an intrusive growth of species more characteristic of open meadows and hillsides.

The area immediately surrounding the collecting locality is comparatively undisturbed woodland. In places near the lake-shore the lower branches of the trees have been trimmed, and a woodroad runs parallel to the shore. Both of these factors have caused the introduction of a few species of plants more typical of other environments. In general four plant association groups are recognizable. (Figs. 1 & 2):

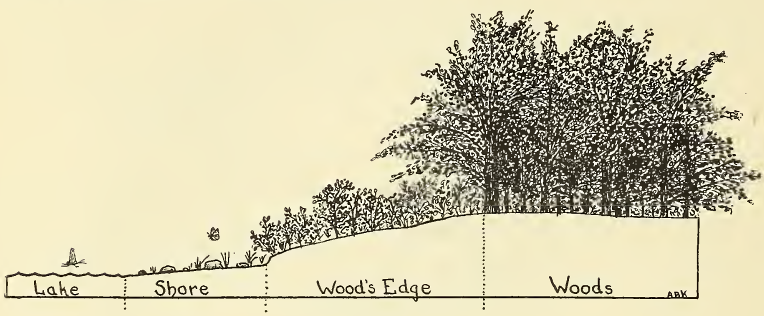


Fig. 1

Fig. 1. Vertical section along NW-SE line through area collected, south shore of Killingly Pond.

a. Lake. Killingly Pond supports surprisingly little aquatic vegetation. The bottom is largely sand and gravel, thickly studded with large granite and gneiss boulders. Occasional masses of a green Alga (*Ulothrix?*) occur, floating loose, and *Chara* also occurs uncommonly, sometimes at considerable depths. Water lilies (*Castalia*) though very abundant on neighboring ponds are practically absent.

Of the Lepidoptera taken *Elophila plevie* Dyar, *Geshna primordialis* Dyar and the three species of *Nymphula* may safely be assigned to this area.

b. Shore. Due to the fluctuations of the water level a rather abnormally wide area of shore-line supports little permanent vegetation. The ground is mainly sand and gravel, thickly covered with stones and boulders. In many places where the more gently sloping shore has caused the formation of coves the shore area becomes greatly broadened. The dominant vegetation consists of grasses, sedges, goldenrods (*Solidago*), and asters (*Aster* spp.).

c. Wood's Edge. A zone along the edge of the woods varying in width from only a foot or two up to fifteen or twenty feet supports a growth of many species not found in the true woods area. The determining factors in the limitation of this zone appear to be light, humidity and soil. Most of the species cannot support themselves under the shade of the taller trees. Lacking this shade to prevent evaporation of water from the soil, exposed to a much greater run-off of surface water due to proximity to the more steeply sloping and less protected shore line, and exposed to winds and storms from the lake with consequently smaller opportunities for the retention of dead leaves and the formation of humus, this area supports those species which can exist in a dryer and more barren environment than the true woods species. Table I gives a census of the woody plants of this and the woods area, as illustrating these points. It will be noted that here occur many species that commonly occur in open meadows and often on barren hillsides.

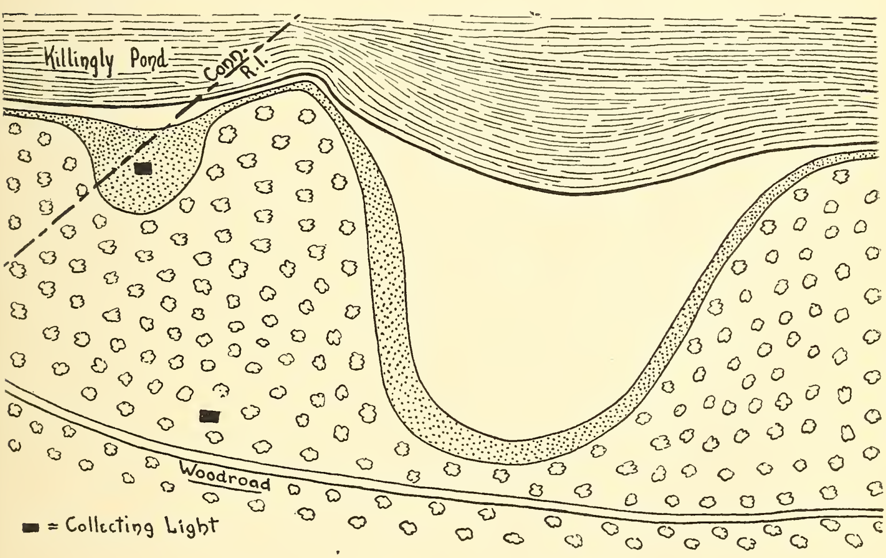


Fig. 2

Fig. 2. Map of area collected, south shore of Killingly Pond, to show plant association groups.

TABLE I—Woody Plants of *Wood's Edge* and *Woods* Areas.
VC = very common, C = common, S = scarce, R = rare.

Name of Plant	In Wood's Edge Area	In Wood's Area
Meadowsweet *S. salicifolia*	C +	
Bayberry *Myrica carolinensis*	C –	
Sweet Fern *Comptonia peregrina*	C –	
Willow *Salix* sp.	C	
Black Chokeberry *Aronia nigra*	C +	
Highbush Blueberry *V. corymbosum* & vars.	VC	C
Winterberry *Ilex verticillata*	C +	C –
Huckleberry *Gaylussacia resinosa*	C +	C
White Birch *Betula populifera*	S	R
Sweet Clethra *C. alnifolia*	S	C +
Hazelnut *Corylus americana*	C	VC
Chestnut *Castanea dentata*		VC +
White Oak *Q. alba*		VC +
Red Oak *Q. rubra*		VC
Scrub Oak *Q. ilicifolia*		VC
Wild Cherry *Prunus serotina*		VC
Witch Hazel *Hamamelis virginiana*		VC
Shagbark Hickory *Carya ovata*		C +
Red Maple *Acer rubrum*		C +
White Pine *P. strobus*		C

TABLE I—(*Continued*).

VC = very common, C = common, S = scarce, R = rare.

Name of Plant	In Wood's Area
Virginia Creeper *Ampelopsis*	C
Hemlock *Tsuga canadensis*	C –
Large-toothed Aspen *Populus grandidentata*	S
Juneberry *Amelanchier canadensis*	S
Tupelo *Nyssa sylvatica*	S
White Ash *Fraxinus americana*	S
Dwarf Juniper *Juniperus communis*	S
Hawthorn *Crataegus* sp.	S
Grape *Vitis* sp.	S
Withe-rod *Viburnum cassinoides*	S
Arrow-wood *V. dentatum*	S
Maple-leaved Viburnum *V. acerifolium*	S
Sheep Laurel *Kalmia angustifolia*	S
Green Briar *Smilax rotundifolia*	R

EXTRALIMITAL (Not in area collected, but within at least a half-mile).
Quaking Aspen, *P. tremuloides.*
Sassafras, *S. variifolium.*
Poison Dogwood, *Rhus vernix.*
Spicebush, *B. aestivale.*
Speckled Alder, *A. incana.*
American Elder, *S. canadensis.*

d. Woods. The dominant features in the determination of the population of this area have just been discussed. The woody plants are listed in Table I. No attempt has been made to separate the Lepidoptera according to their occurrence in the three land zones. With the adults such separation would of course be impossible, due to their powers of flight and the proximity of the areas. By listing the food-plants of the larvae some separation could be made, but it has been thought best to leave this task for a time when the area has been more thoroughly collected.

List of Lepidoptera.

In the following list the arrangement and taxonomy of the families is that of W. T. M. Forbes in "The Lepidoptera of New York and Neighboring States," Cornell University Agricultural Experiment Station Memoir 68. In the Microlepidoptera, Pyraloids and Bombyces the nomenclature of this work has been followed. In the remainder of the list the nomenclature is that of Barnes & McDunnough's "Check List of the Lepidoptera of Boreal America." Genera and species have been placed in alphabetical order for convenience in reference.

All determinations have been checked by comparison with the Cornell University collection, and in many cases with the U. S. National Museum collection as well. The author is indebted to Dr. Forbes for assistance in the determination of many species throughout, to Messrs. August Busch and Carl Heinrich for checking (and in some cases correcting!) many identifications in the "micros," and to Mr. A. Glenn Richards, Jr., for the identification of most of the Noctuidae. He also wishes to thank many of his friends at East Killingly for their interest and assistance.

Many species of flown "micros" are practically unidentifiable. Such have merely been listed as "sp." or queried. Not much reliance is to be placed on such queried determinations.

Those forms marked with an asterisk are not in the Check List of the Insects of Connecticut, Hartford, 1920, and are therefore presumably new records for that state, even though most of the specimens actually *were* taken in Rhode Island. The author hopes that this complication may not prove embarrassing for those interested in state lists.

Nepticulidae—5 species

Ectoedemia castaneae Busck? Jy 25.
obrutella Z. Jy 23, Aug. 25, Sep. 1.
* *populella* Busck. Aug. 25.
**Nepticula bifasciella* Clem. Jy 25.
latifasciella Chamb.? Aug. 14.

EUCLEIDAE—3 species
Adoneta spinuloides H–S. Jy 20, 21, 25, 27.
Lithacodes fasciola H–S. Jy 21, 23.
**Tortricidia pallida* H–S. Jy 23, 24, 26.

TINEIDAE—16 species
Amydria effrenatella Clem. Jy 21, 22, 23, 24, 25, Aug. 4, 14. Common.
Diachorisia costisignatella Clem. Aug. 14, 25, 26, Sep. 1.
sp. Jy 25.
sp. Aug. 30.
Hybroma servulella Clem. Jy 25, 27.
Monopis biflavimaculella Clem. Aug. 25.
dorsistrigella. Jy 22, 23, 24, 25.
Scardia approximatella Dtz. Jy 20.
Tinea arcella Fabr. Aug. 4.
* *auropulvella* Chamb. Jy 25.
carneriella Clem.? Aug. 26.
croceoverticella Chamb.? Jy 24.
fuscipunctella Haw. Jy 23, 25, Aug. 4, 24, 25, 31. Some of the specimens are undoubtedly this species, while others are doubtful.
granella L. Aug. 7.
* *marmorella* Chamb. Aug. 24.
Xylesthia pruniramiella Clem. Jy 21, 25.

TISCHERIIDAE—1 species
Tischeria malifoliella Clem. Jy 23.

LYONETIIDAE—1 species
Bucculatrix sp. Cocoons common on wire mosquito-netting of the camp.

OPOSTEGIDAE—1 species
Opostega albogalleria var. *quadristrigella* Chamb. Jy 23.

GRACILARIIDAE—4 species
Gracilaria belfrageella Chamb. Jy 23, 25, Aug. 4.
Parornix preciosella Dietz. Aug. 7, 14.
Parornix sp. Aug. 7, 14.
Lithocolletis sp. mining in *Betula populifera.*

COLEOPHORIDAE—4 species
Coleophora atromarginata Braun.? Aug. 7.
cretaticostella Clem.? Aug. 7, 14, 25, 26, 27, 30, 31, Sep. 1.
polemoniella Braun.? Aug. 7.
sp. Jy 21.

OECOPHORIDAE—7 species

Agonopteryx allenella Wals. Jy 22.

Borkhausenia ascriptella Busck. Jy 20, 21, 23, 24, Aug. 7, 14, 31, Sep. 1. Very common.

Gerdana caritella Busck. Jy 21.

Martyringa latipennis Wals. Jy 20, 22, 23, 24, 25, 26, Aug. 3, 4, 14, 26. Very common.

Psilocorsis quercicella Chamb. Jy 11, 26, 27, Aug. 3. See next species.

**reflexella* Clem. Jy 11, Aug. 3. The adults are often very difficult to distinguish from *quercicella*. The larvae are, however, quite distinct. At Killingly Pond the skeletonizing of oak leaves by the larvae of both species was one of the most noticeable features of the woods.

Schiffermuelleria argenticinctella Clem. Jy 25, 26, 27, Aug. 3, 4. Quite common. The larva mines under the bark of Elder. No Elder occurred within a half-mile of where the adults were collected.

XYLORICTIDAE—1 species

Stenoma querciella Busck. Jy 25, Aug. 7.

GELECHIIDAE—11 species

Anorthosia punctipennella Clem. Jy 11, 21, 24, 26, Aug. 3, 7.

Aristotelia absconditella Walk. Jy 21, 23, 24.

roseosuffusella Clem. Jy 21, 22.

*sp. near *pudibundella* Z. The males have a prominent patch of sex-scaling on the under side of the primary.

Battaristis conclusella Walk. Jy 25.

Epithectis attributella Walk. Aug. 14.

**subsimella* Clem. Aug. 19.

Gelechia trialbamaculella Clem. Aug. 14.

**Glyphidocera aequepulvella* Chamb. Jy 25.

Telphusa palliderosacella Chamb. Jy 26, Aug. 3.

Trichotaphe setosella Clem. Sep. 1.

BLASTOBASIDAE—3 species.

Holcocera elyella Dietz. Jy 24.

sp. Aug. 31.

Pigritia sp. Jy 26, Aug. 3.

LAVERNIDAE—2 species.

Lophoptilus eloisella Clem. Jy 24.

**Perimede erransella* Chamb. Jy 25, 27, Aug 7.

GLYPHIPTERYGIDAE—1 species.
**Glyphipteryx circumscriptella* Chamb. Jy 11.

TORTRICIDAE—24 species.
**Ancylis floridana* Z. Jy 26.
Archips fervidana Clem. Aug. 7, 14, 26, 27. Common.
infumatana Z. Jy 25.
rosaceana Harr. Aug. 12, 23, 26, 27. Common.
Cnephasia virescana Clem. Jy 21, Aug. 3, 14, Sep. 1.
Epiblema strenuana Walk. Sep. 1.
Epinotia transmissana Walk. Jy 26, Aug. 3, 14.
Eucosma juncticiliana Wals. Jy 24, 25, Aug. 4, 14.
Eulia velutinana Walk. Jy 27.
**Exartema appendicea* Z. Jy 21.
concinnana Clem. Jy 11.
fasciatana Clem. Jy 26, 27, Aug 3, 4.
punctana Wlsm. Sep. 1.
**Olethreutes albeolana* Z. Aug. 14.
**fuscalbana* Z. Jy 22, 25.
hemidesma Z. Sep. 1.
**Sparganothis gracilana* Wals. Aug. 14, 19, 29.
**idaeusalis* Walk. Jy 21, 25.
sulfureana Clem. Jy 26, Aug. 30.
**Thiodia alterana* Heinr. Aug. 26.
imbridana Fern. Aug. 14.
ochroterminana Kearf. Jy 28, Aug. 25, 26, 31, Sep. 1.
olivaceana Riley.? Jy 21.
**Tortrix clemensiana* Fern. Jy 22.

PHALONIIDAE—3 species.
Hysterosia baracana Busck. Jy 21.
Phalonia atomosana Busck. Sep. 1.
Phalonia biscana Kearf. Jy 20, Aug. 26.

COSSIDAE—1 species.
Prionoxystus robiniae Peck. Jy 29.

PYRALIDIDAE—47 species.
Acrobasis betulella Hulst. Jy 20. A somewhat aberrant specimen.
Argyria nivalis Drury. Jy 21, 22, 23, 24, 25, Aug. 14, 30. Common.
Arta statalis Grote. Jy 20, 21, 22.
Condylolomia participialis Grote. Jy 26.
Crambus albellus Clem. Jy 11 to Aug. Very common.
alboclavellus Z. Jy 26.
elegans Clem. Aug. 14.
hortuellus topiarius Grote. Jy 22.

luteolellus Clem. Jy 21.
**myellus* Hbn. Aug. 30.
**polingi* Kearf. Jy 21, 26.
ruricolellus Z. Aug. 30, Sep. 1.
trisectus Walk. Sept. 1.
vulgivagellus Clem. Aug. 25, 26, 31, Sep. 1.

**Elophila plevie* Dyar. Jy 11 (very common), 20, 21, Aug. 19, 27. I do not understand why this species has apparently been so long overlooked in the North. I have found it most abundant in southern New Hampshire (Chesham). The U. S. National Museum collection contains only a few specimens, mostly from Florida, the type locality. It is apparently a lake species, while *fulicalis* is a stream species.

Eoreuma densella Z. Sep. 1.
Euzophera ochrifrontella Z. Jy 26, Aug. 3, 4.
Evergestis straminalis Hon. Sep. 1.
Galasa nigrinodis Z. Jy 21, 26, Aug. 2.
Geshna primordialis Dyar. Jy 11.
Glyptocera consobrinella Z. Jy 24, 26.
Herculia olinalis Guen. Jy 21, Aug. 2, 3, 4, 7, 26.
**thymetusalis* Walk. Jy 21, Aug. 26.
Homeosoma mucidellum Rag. Aug. 25.
Hulstia undulatella Clem. Sep. 1.
Lipocosma fuliginosalis Fern. Jy 25.
**Mineola amplexella* Rag. Jy 21.
indiginella Z. Jy 20.
**Nymphula gyralis* Hulst. Aug. 26.
maculalis Clem. Aug. 3, 30.
**seminealis* Guen. Aug. 30.
Peoria approximella Walk. Jy 24, 25.
Phlyctaenia tertialis Guen. Jy 24.
terrealis Tr. Aug. 14.
**Platytes panalope* Dyar. Jy 23, Aug. 27.
**Poloccia alticolalis* Dyar. Jy 22, Aug. 7, 19, 27.
**Pyralis costiferalis* Walk. Aug. 25, 27.
**disciferalis* Dyar. Jy 24, Aug. 27.
Pyrausta funebris Ström. Jy 29.
fumalis Guen. Aug. 14.
**Raphiptera argillaceella* Pack. Aug. 26.
**Salebria heinrichalis* Dyar. Jy 26.
Scoparia basalis Walk. Jy 11 to Sep. 1. Common throughout.
Tetralopha asperatella Clem. Jy 26.
**Thaumatopsis pexella* Z. Aug. 30.
Varneria postremella Dyar. Jy 22, 25, 26.
Vitula edmandsii Pck. Jy 22, Aug. 14, 27, Sep. 1.

PTEROPHORIDAE—3 species.
**Platyptilia carduidactyla* Rly. Jy 22.
**tesseradactyla* L. Sep. 1.

EUPTEROTIDAE—1 species.
Apatelodes torrefacta S. & A. Jy 24, 25.

LASIOCAMPIDAE—1 species.
Tolype velleda Stoll. A full-grown larva Aug. 17.

DREPANIDAE—2 species.
Drepana arcuata Walk. Aug. 14.
Eudeilinea hermineata Gn. Aug. 19.

GEOMETRIDAE—12 species.
Apicia confusaria Hbn. Jy 22, 27.
Cinglis inductata Gn. Aug. 19, 26, 27, 31, Sep. 1.
Eustroma diversilineata Hbn. Aug. 24, Sep. 1.
Hydria undulata L. Jy 22, 23, 25.
Macaria granitata Gn. Jy 26.
Metanema inatomaria Gn. Aug. 14.
Parallelia bistriaris Hbn. Jy 26, 27, Aug. 2.
**Paraphia unipuncta* Haw. Aug. 24, 27, 30.
Philobia aemulataria Walk. Aug. 26.
Physostegania pustularia Gn. Aug. 25, 27.
Sabulodes transversata Dru. Jy 25, Aug. 1, 3, 14, 24, 25, 27, 30, 31.
Synelys enucleata Gn. Jy 25, Aug. 1.

SPHINGIDAE—5 species.
Ampelophaga choerilis Cr. Jy 26.
Ceratomia undulosa Wlk. Jy 22.
Paonias excaecatus S. & A. Jy 25.
myops S. & A. Jy 24.
Sphinx kalmiae S. & A. Jy 30.

NOTODONTIDAE—9 species.
**Datana drexelii* Hy. Edw. Jy 20, 22.
ministra Dru. Jy 25.
Fentonia marthesia Cr. Jy 20, 26.
Gluphisia septentrionalis Wlk. Aug. 14.
Harpyia borealis Bdv. Aug. 7.
Heterocampa bilineata Pck. Jy 30.
Ianassa lignicolor Wlk. Jy 25.
Schizura unicornis S. & A. Aug. 26.
Symmerista albifrons S. & A. Jy 23.

LIPARIDAE—2 species.
Olene atomaria Walk. Jy 22 to Sept. 1. Common.
Porthetria dispar. Regularly in small numbers Jy 25 to Aug. 17.

NOCTUIDAE—63 species.

Achatodes zeae Harr. Aug. 27.
Agrotis baja Fabr.. Aug. 26, Sep. 1.
bicarnea Gn. Aug. 31.
geniculata G. & R. Common. Jy 23 to Sep. 1.
**jucunda* Wlk. Jy 25.
normaniana Grt. Aug. 24, 25, 31.
phyllophora Grt. Jy 21, 26.
unimacula Morr. (*haruspica* Grt.). Jy 24, 25, 28.
ypsilon Rott. Sep. 3.
Caenurgia erechthea Cr. Jy 24.
Catocala andromedae Gn. Jy 29, 30, Aug. 3.
epione Dru. Jy 29, Aug. 3, 27, 29.
gracilis Edw. Jy 29, 30, Aug. 2.
*f. *sordida* Grt. Aug. 31
ilia Cr. Jy 26, 27, 29, 30, Aug. 1, 3.
*f. *conspicua* Worth. Jy 27.
**similis* Edw. Jy 30.
ultronia Hbn. Jy 27.
Chutapha periculosa Gn. Aug. 25.
f. *v-brunneum* Grt. Aug. 26, 29.
**Cirphis insueta* Gn. Jy 21.
multilinea Wlk. or *phragmatadicola* Gn.? Aug. 27.
**Dyspyralis illocata* Warr. Common. Jy 21 to Aug. 19.
nigellus Strkr. Jy 20, 22, 25.
Epizeuxis aemula Hbn. Very common Jy 17 to Aug. 24.
americalis Gn. Jy 26, Aug. 27, 31.
l. lubricalis Gey. Jy 24, 26, 30, Aug. 3, 4, 25.
rotundalis Wlk. Very common, Jy 20 to Aug. 19.
scobialis Grt. Jy 22, 23, 25, 26, 27.
**Eueretagrotis attenta* Grt. Jy 23.
Euxoa messoria Harr. Aug. 30.
Feltia herilis Grt. Aug. 29.
subgothica Haw. Aug. 19, 25, 27.
**Gabara bipuncta* Morr. Jy 20, 21, 22.
**Harrisimemna trisignata* Walk. Aug. 3.
Lithacodia bellicula Hbn. Jy 22, Aug. 29.
muscosula Gn. Jy 21, Aug. 3.
Matuta elimata Gn. Jy 30.
Menopsimus caducus Dyar. Very common, Jy 18 to Sept. 1.
Metalectra discalis Grt. Aug. 1, 3.
quadrisignata Wlk. (*contracta* Wlk.). Jy 29.
Nephelodes emmedonia Cr. (*minians* Gn.). Aug. 31.
**Oligia minuscula* Morr. Aug. 29.
Palthis angulalis Hbn. Aug. 3.

Pangrapta decoralis Hbn. Jy 27, Aug. 3.
Panopoda rufimargo Hbn. Jy 31.
**Panthea furcilla* Pack. Jy 26, a suffused aberration.
Polia detracta Wlk. Jy 29.
goodelli Grt. Jy 28.
purpurissata Grt. Aug. 25, 30.
Porosagrotis vetusta Wlk. Aug. 25, 30.
Pyrophila pyramidoides Gn. Common Jy 26 to Aug. 29.
Renia factiosalis Wlk. Common Jy 20 to Sept. 1.
flavipunctalis Gey. Jy 31, Aug. 7, 14.
Rhynchagrotis alternata Grt. Jy 29, 31.
Rivula propinqualis Gn. Jy 25.
Salia interpuncta Grt. Jy 28.
Septis arctica Bdv. Aug. 13.
lignicolor Gn. Jy 27.
Sidemia devastatrix Brace. Aug. 7.
Sideridis congermana Morr. Aug. 1.
Syneda limbolaris Gey. Jy 11, 25.
Trachea indocilis Wlk. Jy 21.
***Zanclognatha laevigata* Grt. Very common throughout. Includes named forms *modestalis* Fitch, *reversata* Dyar and *obsoleta* Sm.
jacchusalis Wlk. Jy 20, 24.
ochreipennis Grt. Common Jy 11 to Aug. 7.

ARCTIIDAE—5 species.
Apantesis vittata f. *phalerata* Harr. Aug. 27.
**Eubaphe aurantiaca* f. *brevicornis* Wlk. Sept. 1.
f. *immaculata* Reak. Jy 20, 21, 24, 28, Aug. 7.
Haploa clymene Brown. Jy 28, Aug. 1.
Hyphantria textor Harr. Jy 20.
Phragmatobia fuliginosa L. Jy 20.

LITHOSIIDAE—2 species.
Clemensia albata Pack. Jy 20.
Crambidia pallida Pack. Very common throughout.

NOLIDAE—1 species.
Roeselia minuscula Z. Jy 21.

EUCHROMIIDAE—1 species.
Scepsis fulvicollis Hbn. Aug. 19.

The author is fully aware that conclusions drawn from such inadequate data as two months collecting may be misleading. One point, however, seems worthy of notice. Below are listed those families of which the greatest numbers of species were taken at Killingly Pond, with a similar list compiled from Barnes & McDunnough's Check List for all of Boreal America.

Killingly Pond		Boreal America	
1. Noctuidae	63 species	1. Noctuidae	2532 species
2. Pyralidae	47	2. Geometridae	1024
3. Tortricidae	24	3. Pyralididae	955
4. Tineidae	16	4. Tortricidae	686
5. Geometridae	12	5. Gelechiidae	381
6. Gelechiidae	11	6. Gracilariidae	196
7. Notodontidae	9	7. Arctiidae	196
8. Oecophoridae	7	8. Tineidae	127

The most striking feature of a comparison of the two lists is the exceedingly small number of *Geometridae* taken at Killingly, and the disproportionately large number of *Tineidae*. The *Gracilariidae* also occurred in very small numbers, occupying only thirteenth place at best on the Killingly list, in comparison with sixth on the Barnes list. For the small catch of *Geometridae* and *Gracilariidae* little explanation can be offered. Both these families are rather rigidly adapted seasonally, occurring in definite broods, as a response to the seasonal adaptation of their food, the leaves of green plants. The same holds true, however, for many other families, whose numbers were comparatively normal. For the *Geometridae,* moreover, midsummer is the best time for many of the species, and a wooded environment is usually the best. As regards the *Tineidae,* however, there seems to be a logical explanation. Most of the species if not all are scavengers and fungus-eaters. Not only is a damp woodland with plenty of decaying vegetation an ideal spot for such a group, but also such an environment and food tends to make the species more independent of seasonal changes. We should therefore expect to get an abnormally large number of Tineids in a comparatively short period of collecting when a large number of other species would be missed because of the definitely limited period of flight of each species. The Tineid foods are undoubtedly available for a much greater part of the year than are the green leaf foods of most of the other families. The same line of reasoning may be applied in the case of many other scavengers, fungus-feeders, wood-borers, and to a certain degree seed-eaters. The extraordinary abundance of *Crambidia pallida* in the Killingly woods may be traced to the corresponding abundance of its food—lichens—on the granite boulders.

Possibly the abnormally cold nights upset the normal ratios of numbers of moths flying. Why this should not do so equally for all I cannot guess, if indeed it had any effect of the sort.

CHIRONOMID LARVAE ASSOCIATED WITH WATERSNAILS.*

By Clarence H. Hoffmann, University of Kansas, Lawrence, Kansas.

Although some work with Chironomid larvae and watersnails has been done in London, so far as the writer has been able to determine, no one in this country has endeavored to work out their relationship. It was during the summer of 1930, while attending the Biological Station of the University of Michigan, that my attention was first attracted to this relationship. Mr. S. B. Talbot, a student in parasitology, was having some difficulty in keeping experimental snails alive and he made numerous dissections in the hope of finding the causal factor in the mortality. In one of these dissections he found an insect larva, which Dr. H. B. Hungerford recognized to be that of a Chironomid. I, therefore, collected and isolated a large number of snails with the hope that some of them were infested, and that a study of the life history of the larva could be made.

All of the collections were made in the Douglas Lake region, Michigan. Douglas Lake proper is of irregular outline, two and one-half miles wide and four miles long, and yielded large numbers of snails along its sandy and rocky beaches at certain points. *Physa ancillaria* (Say), in particular, was very abundant on the sand and rocks of Grapevine Point, usually being covered by two or three inches of water. At Ingleside, I made collections of snails in water from a few inches in depth up to a foot, while at Hook Point the water level varied from a half-foot to a foot or more. In all cases, the snails were brought to the laboratory in water.

On August 4, I found a small red larva, 4 mm. long in a *Physa ancillaria* (Say). As soon as the body of the snail was removed from the shell, the larva emerged and crawled very rapidly to the far end of the dissecting dish. It was very active and would wheel its body around as if to fight the dissecting needle. An attempt was made to get the larva to enter different species of snails, both small and large, but the effort was futile. Sometimes it would enter between the foot and shell of a snail, but it

* Contribution from the Biological Station of the University of Michigan.

never ventured any further and the snail in no case appeared to be inconvenienced.

As I have suggested before, numerous collections and isolations were made during the last of July and the month of August. Either five or six snails were then isolated in a pint bottle containing lake water and a leaf of lettuce for food. The top of the bottle was covered with a piece of plankton-net cloth, which was fastened tight by means of a rubber band. For the welfare of the snails, the water was changed at least once a day and the food every other day. At the end of my stay, August 31, dissections were made of these snails—that is, the ones which had survived—and not a single larva was revealed. A more detailed report on the number and mortality of each species of snails isolated and observed is given in Table I.

TABLE I. NUMBER AND MORTALITY OF EACH SPECIES OF SNAILS ISOLATED AND OBSERVED.

Date of collection and isolation	Place of collection in Douglas Lake region	Name of species	Number	Mortality by 8/31/30
7/27/30	Grapevine Point	*Physa ancillaria* (Say)	31	16
7/27/30	Grapevine Point	*Physa heterostropha* (Say)	16	7
8/ 8/30	Ingleside	*Physa ancillaria* (Say)	25	5
8/ 8/30	Ingleside	*Physa parkeri* (Currier)	30	20
8/16/30	Grapevine Point	*Physa ancillaria* (Say)	60†	15
8/21/30	Ingleside	*Physa ancillaria* (Say)	42	17
8/21/30	Ingleside	*Lymnaea stagnalis* (Say)	30	22
8/21/30	Ingleside	*Planorbis companulatus* (Say)	29	8
8/24/30	Hook Point	*Physa ancillaria* (Say)	66	5
		Total	329	115

† Immature forms.

The majority of snails collected, however, was brought to the laboratory in lake water, later killed with hot water, and preserved in 80 per cent. alcohol. These were shipped to the University of Kansas where I made dissections in the fall. Since the snails were killed in hot water, the body of the snail was drawn to the exterior of the shell. By grasping the foot with a pair of forceps, one could with a certain amount of care and practice, remove the body intact from the shell. The search for the larvae then began with the aid of a binocular. This study revealed only five Chironomid larvae in 5,137 snails, which is a surprisingly small infestation, and might account for the fact that I learned but little concerning their life history during the past season. It may be, however, that the larvae are more plentiful some years than others, or that the infestation may be greater in different localities of the country. A complete record of the collections and dissections of snails made as well as of the larvae found is presented in Table II.

Barnard found that the Chironomid larvae in *Limnaea peregra* enter the pulmonary orifice, and burrow in the mantle eventually reaching the liver.[1] The larvae I obtained from preserved material were all situated in the mantle cavity (see Fig. 1). It is

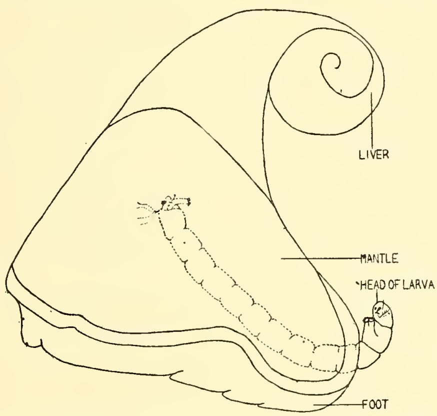


Fig. 1. *Physa ancillaria* showing position of chironomid larva.

interesting to note that these larvae were found in three species of snails in the Douglas Lake region; namely, *Physa ancillaria* (Say), *Physa heterostropha* (Say), and *Lymnaea humilis* (Say). In the case of *Physa ancillaria* (Say), larvae 5 mm. long were found in both mature and immature forms, which were 13 mm. and 7 mm. long, respectively. Finally, I may state that only five Chironomid larvae were found in 5,466 snails, this number repre-

[1] Barnard, K. H. "Chironomid Larvae and Watersnails." In *Entomologist's Monthly Magazine*. Vol. 47. 1911. P. 76.

senting those isolated and dissected as well as the preserved material that was dissected.

The particular Chironomid larva which I found in the snails was determined through the courtesy of Dr. O. A. Johannsen, who places it in the genus *Chironomus* and sub-genus *Endochironomus.* Since as Dr. Johannsen suggests, it is only by rearing that we will be able to determine the species concerned and whether it exists as a parasite or a predator,[2] it is sincerely hoped that some entomologist will solve this interesting relationship practically untouched in this country.

Table 2. Record of Collections and Dissections of Snails

Date of collection	Place of collection in Douglas Lake region	Name of Species							
		Physa ancillaria (Say)	*Physa parkeri* (Currier)	*Physa heterostropha* (Say)	*Physa gyrina* (Say)	*Lymnaea stagnalis* (Say)	*Lymnaea humilis* (Say)	*Lymnaea emarginata* (Say)	*Planorbis companulatus* (Say)
7/31/30	Grapevine Point	20*							
8/ 1/30	Hook Point								24
8/ 2/30	Grapevine Point	22							
8/ 4/30	Grapevine Point	1		1*	8	2			
8/ 4/30	Hook Point	124	4	1				6	
8/ 5/30	Grapevine Point	118*		4			32	39	
		134†					42		
8/ 6/30	Grapevine Point	554†							
8/ 8/30	Ingleside	618	212			601	44	8	170
8/12/30	Hook Point						15		117
8/12/30	Monro Lake				40				
8/21/30	Ingleside	189	81				13*	7	42
8/21/30	Sedge Pool					499			
8/23/30	Grapevine Point	511*†					2		
8/24/30	Hook Point	157	16					2	8
8/28/30	Ingleside	420	196	2				30	1
	Total	2868	509	8	48	1102	148	92	362

* Chironomid larva found.
† Immature forms
N. B.—Total number of specimens examined 5137.

[2] Suggested to writer in letter from Dr. Johannsen.

Dendrothrips ornatus Jablonowski, 1894.—Professor C. C. Hamilton, associate entomologist of the Agricultural Experiment Station, New Brunswick, N. J., has taken numerous specimens of this insect on *Ligustrum ovalifolium* Hassk. (California privet) and states that it has been observed during the last three or four years but was more abundant than usual last year on some privet hedges, and apparently doing considerable damage. Professor Hamilton reported that it was generally distributed throughout New Jersey and very abundant in the northern part of the state.

Dr. H. Priesner in his Monograph, " Die Thysanopteren Europas," 1926–1927, page 174, states that the species *D. ornatus* is found in England, Norway, Austria and other northern countries of Europe, on the leaves of *Tilia,* less frequently on *Syringia, Ligustrum* and *Alnus,* and likewise in great numbers on linden, and only occasionally in blossoms and in turf. Adults hibernate in moss and under the bark of trees.

This is the first record of the finding of this species in North America.—Dudley Moulton, San Francisco, Calif.

NOTES ON WEST INDIAN AND CENTRAL AMERICAN FLEA-BEETLES (HALTICINAE),

By Doris H. Blake, Bureau of Entomology, United States Department of Agriculture.

The present paper is composed of miscellaneous notes on various American Halticinae, made in the course of the writer's study, together with descriptions of two new species.

Species of Homophoeta in the West Indies and North American Confused with *H. aequinoctialis.*

The original description of *Homophoeta aequinoctialis*[1] calls for a beetle the size of *Coccinella bipunctata,* with a red thorax, violet colored elytra marked by four alternating subrotund white spots, and black feet and antennae. It was collected in "America" by Rolander. According to Linnaeus (*op. cit.,* p. A), Rolander collected in Surinam and also in "Eustatium" (probably the island St. Eustatius, about 200 miles east of Porto Rico, where he may have stopped en route to or from South America).

Like many groups of closely related species in other genera of Chrysomelidae, the species of *Homophoeta* are very similarly marked among themselves, and those having four pale spots on each elytron have for the most part been confused under the name *aequinoctialis.* Several definite characters in the brief Linnaean description—the violet colored elytra with four roundish spots, the black legs, and the size, together with the habitat—separate *aequinoctialis* from the two species of *Homophoeta* with similarly marked elytra found in the West Indies. In addition to having entirely black legs, *aequinoctialis* has also a black metasternum, which is not the case in the two other species here discussed. Specimens in the National Museum from Maroni River, French Guiana, collected by William Schaus, and a series from Georgetown, British Guiana, and Trinidad, collected by H. Morrison, fit the Linnaean description perfectly. The species is also represented from Merida, Venezuela, and Bocas del Toro, Panama, but there are no specimens in the National Museum from the West Indies north of Trinidad. (See Fig. 7.)

Two other species of *Homophoeta* with violet colored elytra having four pale spots, but with femora reddish brown instead of

[1] *Chrysomela aequinoctialis* Linnaeus, Syst. Nat., ed. X, 1758, p. 374.

black, and with pale or brown under surface and quite different genitalia, are found in the West Indies. One of these, the elytra of which vary from violet to purplish brown or even reddish brown, has, instead of the postmedian rounded spot near the suture, a nearly linear, oblique, postmedian spot, the anterior end of which is nearest the suture. This species corresponds with Fabricius's description of *albicollis*[2] from Cayenne. Olivier's figure and description[3] under this name do not agree with Fabricius's description or any form known to the author from northern South America, and his species is probably distinct from Fabricius's. *Albicollis* is represented in the National Museum by specimens from Brazil, British Guiana, Trinidad, Barbadoes, Antigua, St. Thomas, St. Croix, Porto Rico, and Dominican Republic. (See Fig. 8.)

The second species found in the West Indies is variable in markings, and has gone under at least two names. A series from Jamaica presents the typical pattern of *aequinoctialis* with four rounded spots on the elytra, but has the body entirely pale beneath and reddish instead of black femora. In series from Cuba and St. Thomas the majority of the specimens have entirely blue elytra, but some have one to three inconspicuous spots. The specimens with entirely blue elytra in the series from Cuba and St. Thomas have been determined as *Oedionychis cyanipennis* (Fab.),[4] type locality, Santo Domingo, and correspond with the description. Although it has not been put in that genus, the pale frontal spot and the projecting apical tooth on the prothorax place *cyanipennis* in the genus *Homophoeta*. This species is represented from the West Indies in the National Museum by specimens from Cuba, Jamaica, Haiti, Dominican Republic, Porto Rico, St. Croix, and St. Thomas. No specimens are in the collection from South America or Trinidad. (See Fig. 5.)

The form of the aedeagus of this last species is identical with that of the species described by Crotch[5] as *Oedionychis octomaculata,* from Texas. Horn, omitting all reference to the latter name, used the name *Homophoeta aequinoctialis* for this North American species. In the Leng catalogue *quadrinotata* Fab. is synony-

---

[2] *Chrysomela albicollis,* Fabricius, Mant. Insect., vol. I, 1787, p. 76.

[3] Olivier, Entomologie, Vol. 6, 1808, p. 682, pl. 2, fig. 23.

[4] Fabricius, Suppl. Ent. Syst., 1798, p. 97.

[5] Crotch. Proc. Acad. Nat. Sci. Phila., vol. 25, 1873, p. 60.

mized under *aequinoctialis,* but *quadrinotata* as described by Fabricius,[6] from Cayenne, is reddish brown with each of the pale elytral spots surrounded by a dark ring. Nothing like this is before me from the West Indies or north of Mexico. Jacoby also treated it as a synonym of *aequinoctialis* in dealing with the Central American species, but it will probably turn out to be distinct.

Although the West Indian and North American species must be called *Homophoeta cyanipennis* (Fab., 1798), it seems appropriate to retain *octomaculata* Crotch as a varietal name for the form with spotted elytra, which is the only form of this species at present known from the United States.

The following key, in connection with the figures, should serve to distinguish the species.

1. Elytra entirely blue or greenish blue. West Indies but not in the lower Lesser Antilles, Trinidad, or South America. *cyanipennis,* typical form
   Elytra deep blue, greenish, purplish brown, or sometimes reddish brown, usually with four pale spots and a pale humeral margin on each elytron 2
2. Hind femora and metasternum shining black. South America, Trinidad, Panama .... *aequinoctialis*
   Hind femora and undersurface pale, reddish or brown..... 3
3. Median spot on each elytron oblique and linear. South America, Trinidad, West Indies................ *albicollis*
   Median spot on each elytron roundish or pear-shaped, elytra sometimes almost entirely dark with some spots missing or very small. West Indies except lower Lesser Antilles, Florida, Texas ....*cyanipennis,* var. *octomaculata*

Two Species of Disonycha Closely Related to *D. glabrata.*

In a study of the North American species of *Disonycha,* I have found that the genus can be divided into definite groups composed of species very closely related structurally. *Disonycha glabrata* (Fab.) (Fig. 1) is quite different from any other *Disonycha* found in the United States. It is a wide-spread species, originally described from Jamaica, and occurring throughout Mexico and Central America into South America. In the United States it extends through Texas and the Gulf states as far north as New York and Illinois and west to Arizona. Among the Central American species are two, *D. dorsata* Har. and *D. nigrita* Jac.,

[6] *Galleruca quadrinotata* Fabricius, Suppl. Ent. Syst., 1798, p. 98.

that at first glance might seem to be only color varieties of *glabrata.* They have approximately the same size, shape, smooth sculpture, and similar thoracic spotting and pale undersurface.

In *D. dorsata* (Fig. 2a), the lateral elytral margins and epipleura, as in *glabrata,* are usually entirely black, but instead of sutural and median vittae there is a large, round, black discoidal spot. There is another form of this species that might easily be confused with species of the *discoidea* group. This form has the margins and epipleura entirely pale and the discoidal spot is reduced. There is no median thoracic spot and the head is entirely pale. Dissection shows that it is merely a pale form of *dorsata.* To avoid future confusion, the writer is giving this color form the name

Disonycha dorsata, var. **flavolimbata,** n. var. (Fig. 2b).

Type (♂) and 2 paratypes (♂ and ♀).—Cat. No. 43362 U. S. N. M.

Type locality.—Honduras, collected by F. J. Dyer.

Other localities.—La Ceiba, Tegucigalpa, Honduras, collected by F. J. Dyer; Tela, Honduras, collected by C. Denton.

The second species, *nigrita* (Fig. 3), has entirely black elytra. Both *dorsata* and *nigrita* have aedeagi that are very similar to that of *glabrata,* but sufficiently unlike to be readily separable from that species and from each other.

Disonycha ovata n. sp. (Fig. 4).

Small (5 mm.), rounded oblong, shining, pale yellow without distinct occipital or pronotal spotting and with narrow black elytral submarginal, median, and sutural vittae, the submarginal one at apex broadening and becoming paler to form a washed-out apical spot on each elytron. Antennae, except for pale basal and apical joints, apex of tibiae, tarsi, and mouthparts, darkened but not black.

Head with broad smooth occiput, with distinct but not pronounced frontal tubercles, and a few coarse dense punctures near each eye; entirely pale except for a slight deepening in color on occiput and mouthparts. Antennae scarcely half the length of beetle (in ♀ shorter), four basal joints and last apical one pale, the remaining ones dark brown, third and fourth joints subequal. Prothorax considerably over twice as wide as long with slightly arcuate sides, moderately convex, smooth, very indistinctly and sparsely punctate, entirely pale yellow, although in one specimen with a slight darkening indicative of the usual 5-spotted pronotal pattern of *Disonycha.* Scutellum dark. Elytra broadly rounded, somewhat convex, humeral prominences not marked. Surface shining, shallowly and moderately densely punctate. Vittae narrow, the submarginal one widened into a broad washed-out brown apical spot, scarcely uniting with sutural vitta. Epipleura and body beneath entirely pale, except for slight darkening at apex of tibiae and tarsi; finely pubescent.

Length.—4.8–5 mm., width 2.8–3 mm.

Type (♀) and 3 paratypes (♂s).—Cat. No. 43363 U. S. N. M. collected by Frederick Knab, August 1906.

Type locality.—San Salvador, Salvador.

This species is closely related to only one of those hitherto described from Mexico, Central America and North America, *Disonycha brevilineata* Jacoby,[7] from Mexico. It is, however, smaller, than that species and entirely lacks the short apical stripe parallel to the median vitta. It is one of the smallest and roundest of the species of *Disonycha,* and notable because of its short, broad prothorax.

Systena basalis Duval.

Systena basalis Duval, Historia de la Isla de Cuba, vol. 7, 1856, p. 129.

Systena thoracica Jacoby, Biologia Centrali-Americana, vol. 6, pt. 1, 1884, p. 333.

This sexually dimorphic species, in which the elytral vitta is entire in the male and only faintly visible as a small spot at the base of the elytra in the female, has caused considerable confusion. Duval originally described the form that Jacoby later treated as a color variety of his *Systena thoracica,* that is, the form in which only a trace of the elytral vitta is visible. Suffrian[8] states that Dr. Gundlach determined that these two forms are simply male and female of the same species.

Although the pale basal streak on the pronotum in the male specimens from the West Indies is not as clearly defined as in Central American specimens, there is in most West Indian specimens a poorly defined but evidently paler area at the base of the pronotum. Otherwise they do not differ. The species is represented in the National Museum by specimens from Cuba,

[7] Biologia Centrali-Americana, vol. 6, pt. 1, 1884, p. 317.

[8] Archiv. f. Naturg., vol. 33, 1868, p. 212.

Porto Rico, Haiti, and Jamaica in the West Indies, and from Nicaragua and Guatemala in Central America, and Tuxtla, Mexico.

Megistops dissita n. sp. (Fig. 6).

Small (3 mm.), ovate, pale reddish yellow with shining, dark blue, very finely punctate elytra; eyes not contiguous on occiput.

Head entirely pale reddish yellow, front very indistinctly punctate, eyes large, but not touching on occiput, the interocular space being nearly one-third width of head. Antennae about half length of body, filiform, pale reddish yellow, first three basal joints smooth, remainder closely covered with yellow pubescence, second and third joints much shorter than remainder. Prothorax not quite twice as wide as long, with apical angle on lateral margin somewhat widened and rounded, and basal margin slightly sinuate; surface moderately convex, reddish yellow with five very indistinct spots (not visible until specimen was soaked in warm water to cleanse), and with fine, close punctation as in *Megistops liturata* Oliv. Scutellum pale. Elytra rounded, convex, with slight humeral prominences, shining dark blue, very finely, sparsely punctate. Legs and body beneath entirely pale reddish yellow, the elytral epipleura darker brown. Posterior tibiae with the broad spur typical of the genera *Dibolia* and *Megistops*.

Length.—3 mm., width 2.3 mm.

Type (♀).—Cat. No. 43364 U. S. N. M.

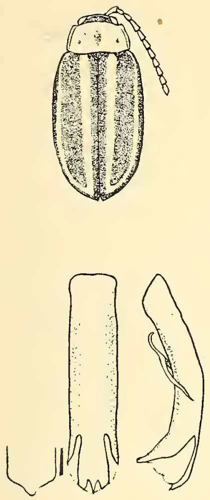
Type locality.—Camp Perrin, La Prise, Haiti, collected by W. A. Hoffman, 26 July, 1925.

This species, described from a single specimen, is unique in the genus, so far as is known, in having the eyes distinctly separated on the occiput. The eyes are large, but the interocular space is plainly visible. Moreover the prothorax is longer and not as wide as in some other species of *Megistops*. The hind tibiae are armed with a broad spur as in both *Dibolia* and *Megistops*. Unlike the species of *Dibolia* the head is not sunken in the prothorax, but is plainly visible from above.

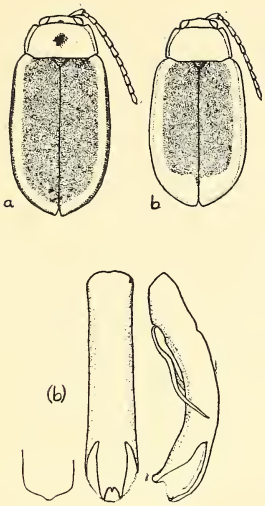
The genus *Megistops*, as described by Boheman,[9] was based on two new species, *quadrinotatus* and *lugubrinus*. He gave the locality for both as St. Fransisco (sic) California. Neither of these species has since been found in North America, and the

[9] Eugenies Resa, 1859, p. 186.

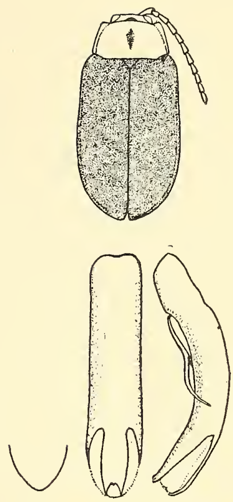
genus is not known to occur in the United States elsewhere. Puna Island and "St. Fransisco, California," are frequently coupled as type localities of species described in the same volume, but in the cataloguing of these species the locality San Francisco is usually dropped. Puna Island is on the coast of Ecuador, south of Cape San Francisco. It seems probable that in these cases there is a confusion of Cape San Francisco, Ecuador, with San Francisco, California. The expedition spent a week at the Island of Puna, and on resuming its voyage northward was retarded by calm and bad weather along the coast of Ecuador. It was anchored for a day off Cape Pasado, and the following day the position of the boat is given in the ship's log as in view of land north of Cape San Francisco. The expedition touched California at only one point, San Francisco, where it remained for a week.



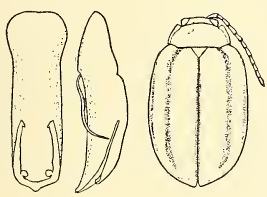
1. Disonycha glabrata



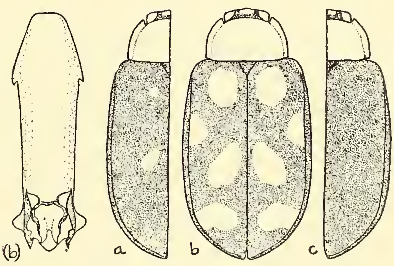
2. a. Disonycha dorsata
b. D. dorsata v. flavolimbata



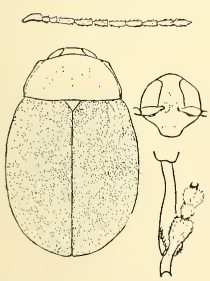
3. Disonycha nigrita



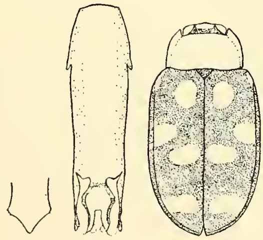
4 Disonycha ovata



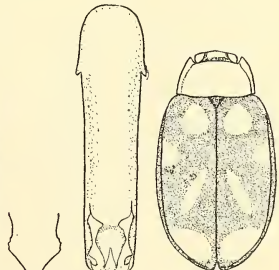
5. Homophoeta cyanipennis c typical form
a. & b. var. octomaculata



6. Megistops dissita



7. Homophoeta aequinoctialis



8. Homophoeta albicollis

NOTES ON THE OVIPOSITION OF METAPTERUS ANNULIPES (STÅL).

(Hemiptera, Reduviidae.)

By Harlow B. Mills, College Station, Texas.

While turning over débris in a dense oak woods two miles north of Le Grand, Iowa, October 27, 1929, a small slender Reduviid of the genus Metapterus was discovered. It was captured alive and unharmed and was kept in a glass jar for observation. It was kept alive for some time on a diet of flies and aphids and, after its death November 17th, it was sent to Dr. P. A. Readio who determined it as *M. annulipes* (Stål). As its biology is practically unknown (vide University of Kansas Science Bulletin, Vol. 28, part 1, p. 70) a few notes concerning this female specimen should be of value.

On October 31 eggs were found on the filter paper which lined the bottom of the jar, and in the course of a week a total of eleven eggs were laid. As the records of McAtee and Malloch and Readio show fall egg-laying of the closely related *M. fraternus* (Say) to be natural, the oviposition in this case was in all probability a normal one.

The egg resembles that of *M. fraternus* (Say) in general, but differs in that it is somewhat shorter and comparatively broader, and in the smaller size of the radial ridges on the cap, when they are present. It is chestnut-brown (the cap lighter), elongate-cylindrical, with a series of longitudinal flanges running from the base to the conical, reticulated cap, or slightly beyond the base of the cap. In some of the eggs the reticulated cap is surmounted by short radial ridges which meet at its apex.

I am indebted to Dr. Readio for the identification of the specimen and for eggs of *M. fraternus* which he kindly sent me for comparison.

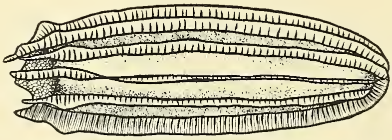


Fig. 1. Egg of *M. annulipes*.

AN UNUSUAL NEST OF THE YELLOW-JACKET, VESPA GERMANICA.

By Phil Rau, Kirkwood, Mo.

This yellow-jacket normally builds paper nests consisting of combs arranged in tiers, one below another, enclosed in several sheets of paper. These are usually made in hollow pockets in the earth, and often when the pocket is too small for the growing nest, the wasps enlarge it, carrying out pellet after pellet of dirt in their jaws.

The literature, at least in so far as my knowledge goes, shows no deviation from this method. Hence I record here a nest at variance with the general method of nest-building and nest location. Individual variations in nest-making behavior are to me always highly interesting, since they often show how the so-called inflexible instincts of nest-building are sometimes so flexible that the wasps can adapt themselves to new environmental conditions in many ways.

This unusual nest was not built in a pocket in the earth, but in a tool closet on a back porch in a Kirkwood home. The floor of this closet was 7 feet from the ground. At the level of the floor was a hole in the wall, one-half inch square, and it was through this hole that the wasps came and went. The closet was seldom disturbed by the owners, and when the door was closed it was as dark as the usual nesting-place of this species. The wasps built the nest on the floor and flush to the opening, and made it to conform in size and shape to the garden tools lying on the floor (Plate IV, fig. 1). As seen in the figure, the nest was flat and low, built about a mole-trap, a discarded piece of down-spout and a bundle of rope. The mole-trap had prongs which prevented the building of a tall nest with several combs. On opening the nest I found, not several combs one beneath another, but one large comb covering as much space as possible between the two barriers. There were better places within the closet in which they could have built, but they (the queen) chose to found the nest as near as possible to the only small opening that this dark cavity afforded. One wonders how the queen ever found this site; one even wonders if she did not hibernate in this sheltered spot during the winter.

During the hour or so in which we watched the nest before photographing it, there were always about 8 to 12 wasps on the outside of the nest (as shown in the photograph), while others were coming and going through the hole in normal fashion.

The combs of *Vespa germanica* are normally built one below another and connected by short props or peduncles, but in this case the combs were reduced to one but this was about three times the normal width. They could not build a skyscraper in this situation, so they expanded in the only direction possible, and made one large comb to the fullest extent that the surroundings would permit. Plate XX, fig 2, the underside of the nest (ceiling) shows how the prongs of the trap limited its upward expansion.

The colony was chloroformed and removed on August 31, 1930, and quite successfully. Of the 125 workers in the nest, all but about ten revived within a half-hour, in response to energetic fanning and abundant fresh air. In addition to these 125 workers taken with the nest, about 25 were out foraging when the nest was removed; these returned in the course of a few hours and were captured. No males or queens were seen in the nest.

The nest and entire colony were enclosed in a roomy wire cage and taken home, a distance of one block. The comb was placed on the wire floor of the cage in its normal position so the larvae would be head downward, but it was also propped up a little on one side so I could get a peep at the activities, with the aid of a flash-light. The cage was also raised a little from the table, so a mirror could be inserted under it. Thus I thought I had shrewdly planned to learn their domestic secrets.

Thus enclosed in the cage, the outfit was placed in the loft of the barn, near the large outside opening; after 24 hours the sliding door of the cage was opened slightly, leaving a crack a half-inch wide which gave them access to the outdoors. I hoped that foraging and nest activities would continue. At first only a few left, and these did so very cautiously, flying about the cage and the loft door for several minutes before venturing out. They had difficulty later in returning, however, not in finding the cage but in finding the small crack in its door; when I slid this open to its full width, they had no difficulty in finding the nest. When the cage was fully opened the air was soon filled with many wasps circling about, studying the landmarks before flying abroad. So great was this excitement that after an hour all but 20 of the wasps had left the nest. I viewed the departure of so many with grave misgivings, for I was much in doubt as to their ability to return to a new site which differed so widely from the characteristic habitat of the species.

To my surprise, the next day I found the colony of wasps, as nearly as I could ascertain, 100 per cent complete! Moreover, they were better organized, for instead of nervously walking all over the cage as they had done before, they were concentrated on the under side of the comb as they would be normally. It is interesting indeed to learn that chloroforming them into insensibility did not mar their mental alertness after they had recovered. Also it is significant that after their careful flights before leaving the new location (the barn loft), they made practically perfect returns. When a ground inhabiting species deviates from its habit to use a wooden closet seven feet above the ground, and then relearns its nest location in a barn loft still higher up, and in order to reach its nest in the room must work its way through a screen of foliage in front of the barn door, then one must admit that this species can adapt itself psychically to new conditions, and with surprising efficiency and celerity.

From this time the work of repairing and extending the nest was pursued with a diligence which was nothing short of intense. The wasps gathered the paper pulp from various sources; the color patches of various grays and tans, brown, black and even a suggestion of red, show this conspicuously. The roof was built of paper, more in the form of bubbles than sheets, in the usual way, and was an inch thick in some places. It took them less than a week to completely repair and cover their torn roof. They did not stop with this but extended the sheets of paper over the bottom as well, enclosing the cells. More than this, they brought paper pulp and spread a heavy curtain of it on the *outside* of the wire cage-bottom just in front of my impudent mirror, so my carefully-planned meddling in their affairs was at an end. Figures 3 and 4 (the latter a close-up of fig 3) show the nest in the cage, with the paper carpet in front and behind the nest. Evidently the wasps did not like to walk on this screenwire floor with an abyss below, so they wove a beautiful carpet through the meshes.

The colony, thus ensconced in the cage in the barn, continued to flourish until the end of summer and constructed an unusually beautiful nest. Almost none of the workers had been lost by leaving the nest. A few, perhaps ten, went back from their foraging trips to the old home site at the neighbor's house a block away. There was now no caution about their departure, and no searching upon their return; they came and went with a zip and a whizz, in a manner very different from that when they first ventured forth in their new surroundings.

May I repeat the salient point of this behavior: to make a flight of orientation and a careful study of landmarks may have been an act of pure instinct, but to recognize, to know when and where to make such a flight, is an act of intelligence comparable with that of man under the same circumstances.

NOTE ON A MIGRATION OF MOSQUITO LARVAE.

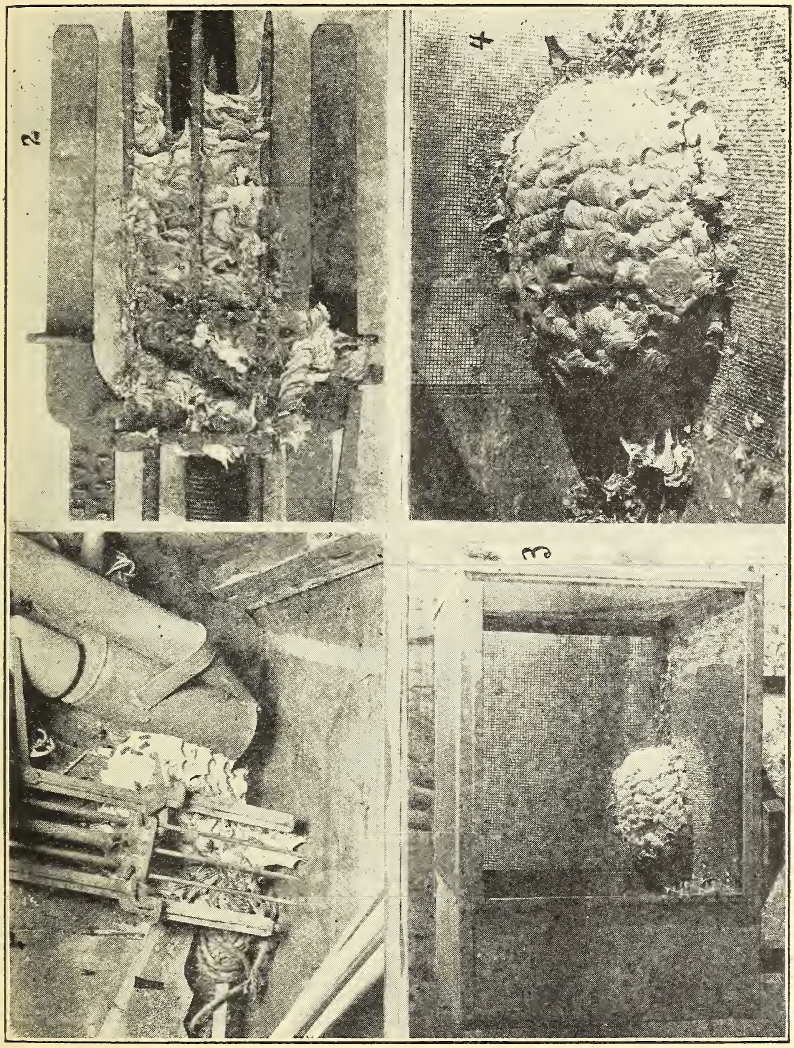
By Sherman C. Bishop and Richard C. Hart, University of Rochester.

In a forthcoming paper we give a brief account of some predacious enemies of the mosquito in Colorado and this record may be supplemented by a note on a remarkable migration of mosquito larvae, observed and photographed June 15, 1930, near Alamosa, Colorado.

The San Luis valley, in which the observations were made, is a broad, flat plain in south central Colorado having an elevation of about 7500 feet and flanked on either side by ranges of high mountains. The valley is extremely fertile under irrigation but otherwise dry except in the vicinity of streams, small lakes and artesian wells.

According to an estimate of the Monte Vista (Colorado) Commercial Club some 700,000 acres are under irrigation. Much of this land is in native-hay meadow and, with the practice of flooding, thousands of acres of ideal breeding places for mosquitoes are created each spring. Water stands on the meadows from a week to a month or more and reaches temperatures varying from 76° to 92° F. Under such conditions, certain species of Aedes may complete their development in seven or eight days. The problem is further complicated by the presence of hundreds of sloughs which, during periods of high water, are filled and usually retain enough water to bring off a generation of mosquitoes.

Many of the roads are bordered by ditches or "borrow pits" having no connection with the drainage or irrigation systems but


2
4
3

which fill by seepage from adjacent meadows. Frequently the water level of the ditch attains that of the bordering meadow and communication between the two is established at intervals. In such a situation the migration to be described below took place.

Local migrations had been observed from time to time as the larvae moved from the deeper sections of the ditch to the warmer grass-grown margins; but at the time when the great majority of the larvae had attained their full growth, a general exodus took place which utimately widely dispersed them over the adjoining meadows and left behind only an occasional pupa that had developed in advance of the movement.

The larvae moved uniformly in the only direction that would lead them to the open waters of the meadow. There was no discernible general movement of the water, for when silt was gently stirred from the bottom it hung in a cloud without drifting. The surface of the water, very slightly agitated by a light breeze, moved slowly in the direction opposite that taken by the larvae. The movement of the larvae was so general and striking we thought the event worthy of pictorial record and a Ciné-kodak was brought into use.

We timed a number of larvae in their transit across a white enamel plate used as a background against which to make our moving pictures. The plate was 8⅝ inches in diameter and the average time of crossing 9.6 sec. Most of the larvae made one stop at the surface en route. If the same rate were continued, the larvae could travel about 54 inches per minute or 270 feet per hour.

The migratory movement continued until the larvae had travelled the entire length of the ditch, about two hundred yards, or until the place was reached where the water spread out to join that of the meadow. An examination of the ditch the following day revealed only a few precocious pupae that had been left behind. The vast majority of the larvae involved in the migration were *Aedes dorsalis* (Meigen).

SOME NEW GENERA AND SPECIES OF LEAF-HOPPERS RELATED TO MESAMIA BALL.

By E. D. Ball, University, Tucson, Arizona.

In a study of relationships of different groups of leafhoppers it was found that certain species formerly included in *Eutettix* and others that have been placed in *Scaphoideus* are more closely related to *Mesamia* than to these genera and that the whole group could be separated into a number of distinct lines of development that warranted characterization as genera along with the descriptions of new forms. The types are in the author's collection unless otherwise stated.

Mesamia tarbela n. sp.

Resembling *straminea* but much shorter with a more angular vertex. Very pale with two black spots on vertex and two on base of scutellum. Length ♀ 3.6 mm.

Vertex similar to *straminea* slightly more angled the margin thicker and a little more elevated. Elytra much shorter and less flaring. Venation similar to *straminea* but with the apical portion shortened. The first cross nervure is doubled on both sides and the second on one. There are fewer costal veinlets.

Color: Vertex white, a pair of approximate triangular spots well back of the apex, a pair of reversed crescents back of these and extending to the ocelli, black. A pair of minute brown dots on the disc near base. Pronotum pale with three black dots in a row behind each eye and an irregular dusky marking on either side the disc. Scutellum white, a round shining black spot inside either basal angle and pair of dots between them. Elytra milky white the nervures and sparse reticulations fuscous.

Holotype ♀ taken by the writer June 15, 1930, in the Huachuca Mts. This species is so strikingly distinct in its small size and definite spots that it seems best to describe it from a single example.

Mesamia straminea var. **dolosa** n. var.

Form and structure of *straminea* nearly slightly larger with markings even heavier than *nigridorsum*. Length ♀ 5.5 mm.

Vertex definitely longer in the middle than against eyes as in *straminea*. Elytra extremely long and flaring. Color: Vertex margin back to suture ivory with 2 black dots, remainder brown. Pronotum dark brown an irregular light band on anterior third with two round dots behind each eye. Scutellum dark with a pair of ivory points. Elytra subhyaline, milky on clavus with a larger fuscous saddle than in *nigridorsum* and heavier nervures. Face smoky with light arcs. All femora showing black to just before the apices.

Holotype ♀ and one paratype female Fort Garland, Colorado, August 11, 1925. One paratype female Trinidad, Colorado, August 7, 1925, all collected by Dr. C. J. Drake.

Mesamia prescotia n. sp.

Resembling *diana* in form and structure, much larger with a longer more angulate head. Larger than *straminea*. Length, 5–6 mm.

Vertex longer and more angular than in *visalia*, right angled, as long as pronotum, the disc almost flat. Vertex and front very acutely angled as in *visalia*. Elytra long, flaring as in *straminea* venation similar, the outer anteapical cell reticulate or divided, costal veinlets numerous often ten to fifteen. Female segment nearly truncate with a slight straplike projection.

Color: dirty straw above and below. Vertex pale orange, the margin appearing as a narrow ivory line with a still narrower black border above and below, a narrow ivory wedge running back from the apex onto the disc. Scutellum with four dashes along basal line, a pair on the lateral margins and the apex ivory. Elytra milky subhyaline with some brown lines in the cells, the nervures brown becoming fuscous on the costa, three pair of ivory spots along the commissure, three black dots in the apical cells, face smoky brown with eight light arcs.

Holotype ♀, allotype ♂ and thirteen paratypes taken by the writer at Granite Dells, Arizona, October 6, 1929.

Mesamia orizaba n. sp.

Resembling *prescotia* but smaller with an obtusely angled vertex. Length 5 mm. Vertex intermediate between *diana* and *prescotia* obtusely angulate with the apex rounding. Elytra flaring the outer anteapical cell divided. Female segment longer with the posterior margin rounding, the strap-shaped portion slightly indented. Color, as in *prescotia* the ivory margin to vertex broader and a similar line at base, scutellum with the basal angles deep orange in the male.

Holotype ♀ and allotype ♂ from the Biologia collection labelled Orizaba (Mex.) H. S. and F. D. G. Dec., 1887. Holotype in British Museum. Allotype in author's collection.

Mesamia ludovicia n. sp.

Resembling *coloradensis* in structure slightly larger with a bluntly angled vertex margin. Pale greenish white. Length 4–5 mm.

Vertex slightly more angulate than in *coloradensis,* the margin thicker and the angle with face more obtuse; female segment with the excavation broader, male plates with the apices divergent.

Color pale milky with a greenish cast, the vertex pale creamy, no markings on vertex face or pronotum. Elytra subhyaline the nervures pale or greenish except towards the apex where they darken a little, frequently faint fuscous reticulations are dotted in on the disc.

Holotye ♀, allotype ♂ and 3 pairs of paratypes taken by the writer August 28, 1918, along with the nymphs on *Artemisia ludoviciana* at LaCrosse, Wisconsin. Typical *coloradenis* has a dark line on vertex margin and the nervures and reticulations dark. Even the pale forms have some dark markings and all have the sharply angled vertex margin.

Genus **Bandara** n. gen.

Similar to *Eutettix* in form and appearance but narrower with the flatter vertex of *Mesamia* ornamented on the margin with lines or rows of dots.

Vertex resembling *Mesamia,* almost flat, wider than long, margins nearly parallel; the anterior margin thick and usually accentuated by markings above and below; angle with front definite but not as acute as in *Mesamia.* The head deep and blunt as in *Eutettix,* front narrower than in either genus, and not widening above antennal sockets as in *Mesamia.* Elytra long and relatively narrow with a simple type of venation resembling that in *Eutettix* except that the nervure separating the 1st and 2nd apical cells is at right angles to costa and the second apical is broad at the base, and nearly semi-circular in outline. There are occasionally extra veinlets at right angles to costa in the region of the first apical cell and sometimes a second cross nervure appears between the sectors. Type of the genus *Eutettix johnsoni* Van D. This small group of narrow, usually tawny or yellow species (*johnsoni, fenestrata, animana* and *aurata*) is apparently a very distinct line of development.

Genus **Twiningia** n. gen.

Resembling *Mesamia* but with a flat, acutely angled vertex a narrow face as in *Scaphoideus* and long narrow elytra with the margins straight to the eyes. Pronotum slightly convex but little above the level of the vertex, slightly wider than the eyes but narrower than the closed elytra. Elytra long and narrow with the outer anteapical cell usually divided, the second cross nervure usually present but sometimes obscure. Venation similar to *Mesamia* but with less reticulations and the numerous cross nervures to costa at right angles as in *Platymetopius* (*sensu strictu*). Genitalia of one general pattern: the female segment very broad at base, the lateral margin narrowed on posterior half the posterior margin roundingly produced on the median half with a variable median notch. Male plates long triangular. Color usually tawny or smoky. Face much narrower than in *Mesamia* resembling *Scaphoideus.*

Type of the genus *Scaphoideus blandus* Ball. This group of species including *S. pellucidus, fumidus, bicolor* and their allies is much more closely related to *Mesamia* and *Platymetopius* than to *Scaphoideus* where they have been placed.

Twiningia magnata n. sp.

Resembling *pellucida* but much broader with a proportionally shorter vertex. Pale testaceous. Length ♀ 5.5–6 mm.

Vertex very broad, flat, slightly shorter than pronotum not quite as long as its basal width. Acutely angled with the face, the apex only little less than a right angle. Elytra very long appressed posteriorly. Venation simple very obscure. Female segment very broadly rounding posteriorly with a very slight, broadly concave, notch in the brown median area.

Color, uniform pale testaceous above, slightly lighter below, the vertex margin definitely white, set off by a dark hair line above. The white line extends across the eyes.

Holotype ♀ and one paratype female Tucson, Arizona, October 20, 1929, taken by the writer in the Santa Rita Mountains. This species is strikingly distinct for this group in its larger size and short head.

Twiningia malvastra n. sp.

Resembling *blanda* but much broader, with a shorter vertex. Pattern of *Mesamia vitellina* but smaller and less tawny. Length 5–6 mm.

Vertex still shorter than in *magnata* with the margins a trifle rounding, longer and more sharply angulate than in *vitellina* with flatter disc. Elytra not as long as in *blanda* with venation and reticulations similar except that the central anteapical cell is wider towards the apex and the second cross nervure is sometimes obscure or wanting. Female segment with the median half roundingly produced, half as long as the segment with the apex slightly bilobed.

Color pale tawny, mottled, face vertex and disc of scutellum creamy, disc of vertex with a tawny cloud interrupted by the white median line. Elytra milky the nervures tawny. An irregular tawny mottling emphasized along the scutellar margins, and an oblique band from middle of costa to the apex of clavus. There is an irregular light area across each cross nervure. Three pairs of dots along commissure and a series in the cells. Darker examples have the tawny shading to fuscous at base and apex of clavus, in the central apical cell and on the costal veinlets.

Holotype ♀, allotype ♂, Glenn Oaks, Arizona, August 19, 1929, and ten paratypes taken by the writer with the types and at Granite Dell, Arizona, from July 19 to October 6, 1929.

A SUPPOSED INSECT LARVA FROM THE JURASSIC.

By T. D. A. Cockerell.

Some time ago a very perplexing fossil, not very well preserved, was found in strata of Jurassic age in New Mexico. The horizon is basal Jurassic, and in the same rocks were many specimens of the fish *Pholidophorus americanus* Eastman. The specimen was collected by Mr. Hugo Rodeck, a member of Professor Junius Henderson's expedition. The locality is 35 miles east of Santa Rosa. I had the idea that the fossil might represent some primitive Crustacean, or ally of the Xiphosura, and having occasion to go to England, took it with me, hoping to get enlightenment at the British Museum. However, it has been carefully examined by Mr. T. H. Withers and Dr. W. T. Calman, and they cannot see any particular resemblance to any Crustacean. Mr. Withers suggests that it is the larva of an insect, and no doubt this is the best guess possible at the present time. There is, indeed, a certain resemblance to the Protoblattoid larva figured by Handlirsch.

Xiphenax jurassicus.

The fossil is elongate, 24 mm. long, of which about 10 mm. is a straight sword-like tail, resembling the terminal structure of a Xiphosuran. It seems certainly to be all in one piece, and to have straight margins, without any evidence of lateral bristles. The head is poorly preserved, but evidently was distinct, not concealed. In the thoracic region, behind the head, the body is narrow, and there are two appendages on each side, evidently legs. No third pair is visible. In the middle portion of the animal are three similar segments, very broadly expanded laterally into pointed projections, of the type of those seen in the larva of the beetle *Silpha,* in which, however, they extend all along the abdomen. Posterior to this middle region is a less expanded segment, very indistinctly preserved, and then comes the straight caudal appendage.

The larva of the beetle *Haliplus* also has analogous lateral processes, but there are twelve on each side.

As regards the tail, a similar structure occurs in aquatic larvae of very diverse orders, as, for instance, in *Ranatra, Cybister* (but it is pubescent laterally) and *Sialis* (but it is bristly at sides).

On the whole, the specimen seems probably to belong to the Coleoptera, but to some unknown and doubtless extinct group.

It may be named **Xiphenax** (new genus) **jurassicus** (new species). Type in University of Colorado Museum.

Were it regarded as a Crustacean, it might be more or less related to *Euthycarcinus kessleri* Handlirsch, from the Trias of Europe, but there seems to be no real affinity.

EDITORIAL.

ENTOMOLOGICA AMERICANA.

We owe it to the subscribers to this journal to inform them as to the delayed appearance of the work of Drs. Böving and Craighead, which is to make up our eleventh volume.

It was our intention to publish this work in four parts, as the MSS. came to hand. The first part was to be issued in March; and the other three, completing the four numbers to the volume of *Entomologica Americana,* were to appear within as short a period as the receipt of the MSS. and the plates permitted. The first number has been in hand for some time. But on reading the proof for pagination, it developed that there were so many blank references to later pages and plates, that it was impossible to make up this first number until the others remaining were in hand, set up, and paginated.

The completed MSS. is now in the hands of our printer; and we hope to have it in form to rush through in about four weeks from this writing, say by the middle of June.

Our subscribers, we are happy to say, are going to get a much larger and more important work than they anticipate. It will run to some 150 pages of matter and descriptions of plates, to go with the 125 plates.

We again bring to the notice of those that have not already sent in their orders for the reprints that our prepublication price holds *only* until the appearance of our first number; and that thereafter the price will be $7.50 per volume, cloth bound. These prepublication prices apply *only* to orders received with cash.

No subscriptions will be accepted for *Entomologica Americana* at our regular price of $4 for the volume, for the single year. All new subscriptions must be for the complete set, at the regular price of $4 per volume. We reserve the right to advance this price without notice, when we begin to encroach on our reserve stock of complete sets.

THE PUBLICATION COMMITTEE.

BOOK NOTES.

A History of Applied Entomology, by E. O. Essig. Pp. i–vii, 1–1029, figures 1–263. (The Macmillan Co., New York, $10.)

The first thought on this work is a comparison with Dr. Howard's *History of Economic Entomology.* These two works are on entirely different planes. Dr. Howard may be read for the sheer pleasure of meeting living men in its pages, their high accomplishments and human foibles. Essig is essentially a reference work; except occasionally, it is to be consulted as a valuable epitome of facts. Its treatment of the subject is not as broad as Howard's, because its reference plane is the development of economic entomology especially in the West and particularly in California. Nevertheless, the two should stand together on the shelves of any entomological reference library that aspires to adequacy.

Chapter I, on "Prehistoric Entomology," treats almost entirely of the insects from the famed Ranch La Brea pits, with minor references to the McKittrick pits and the Carpinteria pit, with mention of one Eocene insect—a dragonfly from Shasta County. These insects, as recorded, are mostly water beetles with a few carabids and tenebrionids; and Odonata. Chapter II is on "California Indians in Relation to Entomology," particularizing the various insects which served as essential food to these aborigines, such as various grasshoppers and *Ephydra hians,* the koo-tsabe fly. Naturally, the personal pests of one kind or another figure in this chapter, as well as sundry other forms either used industrially or more or less injurious, with an interesting list of their Indian names in various dialects. "The Historical Background" forms Chapter III, with references to the Mission period and the various imported insect pests that came in European produce; the Russian period, when entomology as such came into being on the Pacific Coast; and the lurid Early American period, when Lorquin made his collections. This chapter brings us down to 1870 and the introduction of fruit growing in California. In Chapter IV, we get the history of the "Principal Institutions in California Featuring Entomology." These institutions range from the California Academy of Sciences, established in 1853, to the California Entomological Club, founded in 1930, at Sacramento. The Universities—Stanford and California—and Pomona College, their staffs, present and past, and their objectives, are, of course, included. "Some Historical Facts Concerning the

More Important Orchard Mites and Insects of California" are presented in Chapter V; this is full of facts on these pests, their means of control, their ravages; and statistics of all kinds. The "Biological Control of Insects," in Chapter VI, is an extensive résumé of the native insects that serve to keep down their noxious fellows, introduced as well as native; their utility and the methods of encouraging and increasing them. "Insecticides" are discussed in full in Chapter VII; and Chapter VIII presents in brief but complete form "Entomological Legislation." The most interesting (from this reviewer's point of view) Chapter (IX), is briefly headed "Biography." Here we have brief sketches of the lives and labors of the entomologists whose names are, in the main, associated with the rise and progress of entomology as a science on the Pacific Coast, although many of those here and abroad whose names are synonymous with the science are also mentioned. The list begins with Ashmead and closes with Zeller, in alphabetical order. The heading of Chapter X explains it fully: "A Chronological Table Showing the Development and Progress of Entomology in relation to History and Other Sciences." Here are recorded the births and deaths of the great (including entomologists), and the events of the period, listing among them the stages in the growth and development of entomology as a science, brought down to 1929. This historical record, however, goes back only to the middle of the 15th century, and naturally, no mention is made of Aristotle or Pliny, or any of our old favorites, including the Bestiarium. Those contemporaries mentioned, except the dead, appear to be only those in professional ranks. A 77 page index completes the work.

Each chapter deserves a critical study and comment, but in our limited space this is not possible, nor, in fact, desirable. Our general comment is that as a work for ready reference this is invaluable. Its restricted scope enables the author to discuss with a notable degree of completeness the growth of entomology as an important factor in modern civilization in a circumscribed area with relatively homogeneous problems. As we have said before, this is a necessary work to all who wish to have an understanding of the progress of a science whose importance to human welfare (from the purely practical side) becomes daily greater.

We offer the publishers our sincere congratulations on their service to entomology in giving us this valuable work.

J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

Meeting of December 11, 1930.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, December 11, 1930, at 8.15 p. m.

President Davis in the Chair and sixteen other members present, viz., Messrs. Bowdoin, Burke, Cooper, Eisenhardt, Engelhardt, L. Lacey, Lemmer, Lerch, Moennich, Schaeffer, Sever, Sheridan, Siepmann, Torre-Bueno, Wilford, and Dr. Risch, and two visitors.

In the absence of the secretary, Mr. Siepmann acted as secretary *pro tem.*

The minutes of the previous meeting were read and approved.

Mr. Davis proposed for membership Mr. Herman Moennich, 4248 Marathon Parkway, Little Neck, L. I., N. Y.

The motion was seconded by Mr. Engelhardt, and, Mr. Moennich being present, it was regularly moved and seconded that the By-laws be suspended and the Secretary cast one ballot for the election of Mr. Moennich, who was accordingly elected.

Mr. Davis appointed a nominating committee to consist of Mr. Schaeffer, as chairman, and Messrs. Wilford and Cooper.

Mr. Cooper exhibited some specimens of an earwig, *Doru aculeatum* Scud., collected by himself and Mr. Bowdoin at Flushing, Long Island.

Mr. Lacey reported obtaining the autumn form of *Colias eurytheme* form *pallida* during the past fall.

Mr. Burke exhibited a specimen of the rare cerambycid beetle *Anthophilax viridis* Le Conte, obtained on Saturday, July 5, 1930, on Mt. Everett, in southwestern Massachusetts. Mr. Burke said:

"While I was walking down the road from the summit, after visiting the fire tower, this beetle flew onto my hand, which action coming unexpectedly caused me to shake it off onto the ground. Noting its attractive green color I collected it and later compared it with the collection of Wm. T. Davis. There was but one specimen in his collection, and that was one collected by Ernest Shoemaker.

"Alan S. Nicolay in *Jour. N. Y. Ent. Soc.*, March, 1917 (25: 38–44) in an article entitled 'Synopsis of the *Anthophilax* of North America' states: 'This longicorn is extremely rare and very local, evidently preferring the high peaks of mountain ranges. Mr. Ernest Shoemaker is the only local collector fortunate enough to take the species, capturing one male on top of Whiteface Mountain, Adirondack range, New York, July 13, and one beautiful green female taken on blackberry blossoms at Slide Mountain, Catskill range, New York, July 4.' "

Speaking of the local occurrence of Cerambycidae, Mr. Schaeffer remarked that *Gaurotes abdominalis* is ordinarily quite scarce, but on one occasion he found it in large numbers, obtaining fifty or more specimens.

Mr. Davis showed a male *Apatura celtis* butterfly collected by him while it was resting on the side of the old Billop House at Tottenville, S. I., June 26, 1928, and referred to the specimen shown at a previous meeting collected by Mr. Herbert E. Wilford among the *Celtis* trees at Richmond, Staten Island, August 13, 1930. He stated that a Mourning Cloak butterfly (*Vanessa antiopa*) had been observed flying about in his garden at St. George, Staten Island, on December 10, about noon. It was a warm day.

Mr. Engelhardt reported that he observed numerous specimens of the fall canker worm, *Alsophila pometaria* Peck, in Westchester County, during the present month (December). The species was very abundant about 30 years ago, but had become somewhat scarce, possibly due to the introduction of the English sparrow.

Mr. Eisenhardt delivered his paper on the "*Parnassius* of the World," illustrating his lecture with several cases of beautifully mounted specimens. His paper will be published in full as a separate article in the BULLETIN. His lecture was followed by a general discussion on *Parnassius,* and on the meaning of the terms variety, aberration, and subspecies, which was suggested by Mr. Eisenhardt's paper.

Mr. Engelhardt reported that a more suitable place had been obtained in the Brooklyn Museum for the storage of back numbers of the BULLETIN and *Entomologica Americana* owned by the society. The society gave a unanimous vote of thanks to Mr. Engelhardt and Mr. Schaeffer for their efforts to secure this excellent place for the storage of its publications.

Adjourned at 10.30 p. m.

CARL GEO. SIEPMANN,
Secretary pro tem.

MEETING OF JANUARY 15, 1931.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, January 15, 1931, at 8.30 p. m.

President Davis in the chair, and 15 members present, viz., Messrs. Ballou, Bowdoin, Cooper, de Polo, Eisenhardt, Engelhardt, L. Lacey, Lemmer, Lerch, Moennich, Schaeffer, Siepmann, Torre-Bueno, Wilford and Wurster.

In the absence of the secretary, Mr. Siepmann acted as secretary *pro tem.* The minutes of the previous meeting were read and approved.

Mr. Engelhardt presented the report of the treasurer, stating that the society was was in excellent financial condition. He added that there were 58 active members, 3 life members, 5 honorary members, 310 subscribers to the BULLETIN, and 126 to *Entomologica Americana.*

Mr. Torre-Bueno presented a biennial report for the publication committee.

The society gave a unanimous vote of thanks to the treasurer and editor for their excellent management of the finances and publications of the society.

Messrs. Davis and Engelhardt reported the death of Professor Hine, a specialist in the Dipterous families *Tabanidae* and *Asilidae.*

Mr. Engelhardt proposed for membership Mr. Oscar A. de Polo, 171 Lefferts Avenue, Flatbush, Brooklyn, N. Y.

The proposal was seconded by Mr. Davis. Mr. de Polo being present, it was regularly moved and seconded that the By-laws be suspended, and the secretary cast one ballot for his election, which was accordingly done.

Mr. Engelhardt read a letter from the *Entomological News,* addressed to Mr. Bell, concerning an article on Entomological Societies which is soon to be published in that publication.

Mr. Torre-Bueno exhibited and discussed two new books, "The History of Applied Entomology," by Dr. Howard, and "The Life of Thomas Say," by Harry B. Weiss and Grace M. Ziegler.

Mr. Schaeffer, as chairman of the Nominating Committee, presented the following nominations: President, Wm. T. Davis; Vice-President, J. R. de la Torre-Bueno; Recording Secretary, Carl G. Siepmann; Corresponding Secretary, Howard Notman; Treasurer, George P. Engelhardt; Librarian, Dr. Joseph Bequaert; Curator, J. M. Sheridan, delegate to New York Academy of Sciences, George P. Engelhardt.

Mr. Engelhardt proposed Mr. Schaeffer as librarian, Dr. Bequaert, now living in Boston, being unable to attend to these duties.

Mr. Engelhardt moved that the nominations be accepted as proposed and amended, the motion was seconded, and the officers were accordingly elected at nominated.

Mr. Torre-Bueno proposed a vote of thanks to Mr. Bell for his services to the society, which was seconded and carried.

Mr. Engelhardt exhibited a specimen of the European House Cricket (*Gryllus domesticus* L.), collected by himself at Hartsdale, New York. He remarked that although this species is common, and often heard chirping about houses, it is very rarely seen.

Mr. Bueno presented the paper for the evening. He spoke of his collecting experiences at Lake Buel, near Great Barrington, Massachusetts. Very little collecting of Hemiptera had been done in this part of the state, and he obtained a number of Hemiptera new to Massachusetts. Although water bugs were not as numerous as he had hoped, collecting by sweeping, beating and beneath bark was highly successful. He exhibited a box of the most interesting forms obtained. A list of the species will be published separately in the BULLETIN.

Mr. Davis spoke of his collecting trip to Greenwood Lake, N. J., with Mr. Ernest Shoemaker and Hans Stecker, on June 12, 1930, and exhibited some of the material obtained. They explored a number of the ridges of rock on the westerly side of the lake where there were some pitch and white pines, the home of rare buprestids. The following species were collected: *Buprestis sulcicollis, Buprestis striata, Buprestis salisburyensis* (*ultramarina*), *Chrysobothris femorata, Chrysobothris pusilla, Dicerca punctata,* and *Melanophila aeneola.* On the low growing shad bushes on the rock ridges were found eight specimens of *Saperda candida.*

Mr. Engelhardt spoke of having bred *Saperda obliqua* from alder galls.

Mr. Schaeffer mentioned that an inquiry had come to him as to whether flies had preferences or dislikes for certain colors, and whether house flies would be repelled by walls that were painted blue in color. A discussion followed.

The meeting adjourned at 10.15 p. m.

CARL GEO. SIEPMANN.

MEETING OF FEBRUARY 12, 1931.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, February 12, 1931, at 8.20 p. m.

President Davis in the chair and thirteen members present, viz., Messrs. Ballou, Burke, Cooper, Eisenhardt, Engelhardt, Lemmer, Lerch, Moennich, Schaeffer, Sheridan, Siepmann, Wilford, Wurster, and two visitors.

The minutes of the previous meeting were read and approved. Mr. Engelhardt reported for the treasurer and for the publication committee, stating that orders were steadily coming in for Boving and Craighead's "Illustrated Synopsis of the Principal Larval Forms of Coleoptera" and that the publication of this paper as part of "ENTOMOLOGICA AMERICANA" would prove successful from a financial standpoint.

Some unusual cocoons of an Indian Saturnid moth, *Caligula simla,* were exhibited by Mr. Eisenhardt. These cocoons were composed of a network of fibre, the pupa inside being clearly visible through the interstices of the network.

Mr. Engelhardt spoke of his field work devoted for the past several years chiefly to investigations of life histories and to studies of the geographical distribution of the clear-wing moths, family *Aegeriidae,* in the Gulf States and in the South West. Such studies, he explained, are essential to every classification expressing a natural grouping and arrangement of genera and species.

The *Aegeriidae,* a small, compact family, represented in North America by about 150 species, are especially well adapted for investigations of that kind. In their early stages they are all borers in the living tissues of trees, shrubs, and plants. Not only that, but with few exceptions, each species is addicted to one particular or closely related set of plants on which their attacks are restricted to certain parts, which may be solid wood, the bark, branches, stems or roots. When the foodplant and habits are known, it is usually not difficult to check up on the presence or absence of a species in any territory wherever the collector happens to be.

The adult moths, as a rule, are encountered only sparingly in the field. Their average rather small size and often their perplexing similarity in appearance to wasps and bees no doubt help them in escaping notice. The best method by far to collect these insects is by breeding. The great majority of the larvae change to pupae within their own galleries in the foodplant. By obtaining cuttings of the plants with either mature larvae or pupae the moths can then be bred in any ordinary cage or jar.

Mr. Engelhardt illustrated his remarks by specimens selected to show what he called biological groups, as determined by corresponding habits and foodplants. With structural characters in agreement, color differences, he said, merely express climatic effects throughout the range of such groups.

The specimens exhibited included a beautiful series of *Clematis* rootborers, genus *Alcathoe,* arranged according to their geographical distribution across the North American continent. Some in a remarkable way mimicked the so-called tarantula killer wasps (*Pompilidae*). Another series comprising species all borers in woody oak galls showed the effect of intensification due to the humid, warm climate of the Gulf states in contrast to the lighter colors of species and races from the North and from arid regions of the West. One of the specimens in this series was bred from huge oakgalls collected by Mr. Engelhardt in Guatemala during the winter of 1930. The acorns from this oak were as large as hen's eggs.

Mr. Engelhardt also exhibited a box containing butterflies and moths from Florida and Texas, remarking upon their comparative abundance and habits.

Mr. Davis exhibited a box of grasshoppers and other Orthoptera collected by Mr. Engelhardt on his trips to the South and South West, and commented upon their habits.

The meeting adjourned at 10.05 p. m.

CARL GEO. SIEPMANN,
Secretary.

Vol. XXVI JUNE, 1931 No. 3

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, Editor

CARL GEO. SIEPMAN GEO. P. ENGELHARDT

Published for the Society by the

Science Press Printing Co.,

Lime and Green Sts., Lancaster, Pa.,

Price, 60 cents Subscription, $2.50 per year

Mailed October 29, 1931

Entered as second-class matter January 21, 1919, at the post office at Lancaster, Pa., under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

CONTENTS

Bulletin of the Brooklyn Entomological Society

Published in
February, April, June, October and December of each year

Subscription price, domestic, $2.50 per year; foreign, $2.75 in advance; single copies, 60 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXVI | June, 1931 | No. 3

NOTES ON CERTAIN SPECIES OF ATTELABUS, WITH A TABLE OF THE NORTH AMERICAN SPECIES (COLEOPTERA).

By H. C. Fall, Tyngsboro, Mass.

Attelabus axillaris Gyll.

Some months ago I received from Mr. D. K. Duncan, of Globe, Arizona, examples of an *Attelabus* which he believed to be undescribed. The specimens were deep blue or blue black with red humeri and pubescent upper surface, and obviously unlike any of our described species. A little investigation however showed that they conformed well enough with the description of the Mexican *A. axillaris* Gyll., but for further assurance I asked of Mr. Arrow, of the British Museum, the loan of a Mexican specimen for comparison. This was obligingly sent me, and while appreciably larger and with larger red humeral spot which attains the suture, there appeared to me to be no really specific differences from the Arizona form.

The British Museum example was labelled "*axillaris* var." and as a matter of fact agreed less well with the original description than do the Arizona specimens with their smaller size and smaller humeral spot. More recently Mr. Buchanan has sent me a pair of their supposed *axillaris* from the National Museum collection, and these again are like the one from the British Museum.

A. axillaris then must be added to our faunal list. It belongs to the subgenus *Himatalobus* and is similar in form to *rhois* but is slightly smaller, more sparsely pubescent and of course wholly different in color. The sexual characters are as in *rhois*.

Attelabus californicus Voss; and *A. coloradoensis* Voss.

These two species, credited to our fauna, appear in Voss' recent monograph of the Attelabidae (Stett. Ent. Zeit., 1925).

On expressing to Dr. Walther Horn my desire to see these two species, he has been so kind as to send me the unique type of *californicus,* contained in the collection under his charge, and also a "cotype" of *coloradoensis* obligingly loaned by Mr. Voss for this purpose. To both these gentlemen I wish to express heartiest thanks for their friendly help.

With the first glance at the type of *californicus* it was possible to say with virtual certainty that this species is not of our fauna. It belongs to the subgenus *Pilolabus,* the members of which are peculiar to Mexico and Central America, and there can be no doubt that that region is its true habitat. That the species is not from California is further confirmed by the fact that it bears a label "Californien; Coll. Kraatz," identical with that borne by numerous other species sent me by Dr. Horn for identification, not one of which if my memory serves me were actually from California or any other part of our fauna, but were assumed, and probably correctly, to be from Mexico. It is unfortunate that the specific name should have been drawn from the supposed locality, but even so it is not the first insect to receive the name *californicus* though wholly innocent of any connection with that state.

A. (*Himatolabus*) *coloradoensis* Voss.

This so called species is of the type of *rhois* and so far as I can see is not separable therefrom. *Rhois* is widely dispersed in our fauna from New England to the Rocky Mts., and within that range shows much variation in size, color, pubescence and punctuation; just those characters in fact on which Voss bases his *coloradoensis.* I have indeed among a series of *rhois* from Maine one or more examples that almost perfectly match the Voss cotype of *coloradoensis.*

Throughout my series of *rhois* I have observed in the females a secondary sexual character which so far as I know has hitherto escaped notice. This consists of a transverse pair of small compressed tubercles on the first ventral segment, and a similar still smaller pair (very easily overlooked) on the second segment. These tubercles are present in the cotype of *coloradoensis* sent me, which by good luck chanced to be a female.

A. disparipes Chitt.

This recently described species is very closely allied to *rhois* but the few females that I have seen lack the ventral tubercles mentioned above. The pronotum lacks the smoother median line so far as observed, but the other characters mentioned by Chittenden for distinguishing this from *rhois* will I think prove to have little if any value. All specimens seen by me are from Arizona, and this includes a pair of paratypes, for the privilege of examining which I am indebted to the National Museum authorities. Chittenden gives no more precise locality but an example in my own collection and others sent me by the British Museum are from the Chiricahua and Huachuca Mts.

A. constrictipennis Chitt.

A glabrous, shining, entirely black species, with sides of elytra somewhat contracted behind the rather prominent shoulders, described from the Sierra Ancha Mts. Arizona.

Chittenden refers this species to the subgenus *Himatolabus,* but this I think must be an error as all the species of the latter are pubescent, and moreover the Mexican *callosus* to which *constrictipennis* is said to be most closely allied is referred by Voss to the subgenus *Sternolabus.*

The numerous subgenera that have been proposed by European authors in dealing with the world fauna may very well be disregarded in considering the few species occurring within our faunal limits.

The interesting and important secondary sexual characters noticed in our species have been set forth by Frost (including Blanchard *in litt.*)—Phyche, April, 1908, p. 31, and by Chittenden—Proc. Ent. Soc. Wash., Oct., 1926, p. 165. In this connection it should be remarked that the front thighs are toothed in both sexes of *A. bipustulatus* and not in the male only as stated by Chittenden. Blatchley and Leng in their Rhynchophora of North Eastern America evidently overlooked Frost's paper, since they describe the tibiae as armed at tip with two strong hooks (a female character) and repeat Le Conte's inversion of the sexual characters of *A. analis.*

As a matter of convenience to students a table is subjoined including all the species now known from our fauna. In its use it should be borne in mind that males are always recognizable by the single curved spur or hook at the apex of all the tibiae, the tibiae in the female being armed with two such hooks.

Key to North American Species of Attelabus.

1. Upper surface glabrous 2
   Upper surface pubescent; front thighs simple in both sexes .. 3
2. Front thighs not toothed in either sex.
   Color above and abdomen red; head, legs and sterna black. Male with two acute teeth projecting downward from under side of mouth; female with a pair of acute tubercles on each of the first three ventral segments .... *analis*
   Color shining black throughout; elytra transversely impressed at about the basal fourth and wider at the more prominent humeri than posteriorly (Arizona). *constrictipennis*
   Front thighs toothed in the male, simple in the female.
   Color nearly as in *analis,* but a little variable, the prothorax sometimes nearly black, the legs usually black but becoming rarely entirely red; mouth without teeth beneath in the male, ventral segments not tuberculate in the female; average size appreciably smaller than in *analis* .. *nigripes*
   Color black, elytra red with a triangular scutellar space and apical area black, abdomen red. Size small, nearly as in *bipustulatus,* length about 3 mm. (New Mexico) .. *genalis*
   Front thighs toothed in both sexes; color black or blue black with red or reddish yellow humeral spot; size small. *bipustulatus*
3. Color red, slightly variable in tint, head sometimes black in part, rarely in great part blackish in a melanic northern form; median line of pronotum narrowly smoother and usually with a fine impressed line; first two ventral segments of female each with two small more or less compressed tubercles .... *rhois*
   Color nearly as in *rhois,* pronotum without smoother median line; female without the small tubercles on first and second ventrals. (Arizona) .... *disparipes*
   Color deep blue or blue black, elytra with red humeral spot; sexual characters as in *rhois*.. (Arizona) .... *axillaris*

THE NESTS AND NESTING SITES OF FOUR SPECIES OF POLISTES WASPS.[1]

By Phil Rau, Kirkwood, Missouri.

In a paper on the nests of *Polistes*[2] I have stated that, broadly speaking, *P. pallipes* make nests in old buildings; *P. variatus* choose sites in obscure places close to the ground or in pockets beneath the surface of the ground; *P. rubigenosis* in inaccessible places in complete darkness between walls of old buildings or in hollow trees; and *P. annularis* nest in the tree-tops. Since the publication of that paper, I have added the following details.

Polistes pallipes.

The statement that *pallipes* wasps nest in the shelter of buildings of some sort still stands for this region. The only digression noted during the past few years is that sometimes a nest occurs under an overhanging rock. Not one nest of *pallipes* has been found attached to vegetation in exposed places. I want to emphasize the fact that thorough searches in the leafless vegetation in autumn have given negative data, because occasionally one sees references to *pallipes* building among the vegetation in other localities. Neither have I yet seen a *pallipes* nest in a ground situation which is the characteristic site for *variatus,* although as I shall later show, *P. variatus* occasionally adopts the sheltered locations of *pallipes.* Nor have I seen about this region *pallipes* choosing dark, secluded sites as does *rubigenosis.* When *pallipes* nests in buildings, she always chooses well lighted places.

When ample room for expansion is at hand, *pallipes* always makes a round nest with the peduncle in the center. When a wall limits the expansion, the nest assumes a semicircular form, and sometimes in narrow places, it takes on a skyscraper effect.[3]

Another aspect of nest-making sometimes appears in the work of certain individuals. With hundreds of square feet of horizontal ceiling space in a barn on which to make nests, occasionally a *pallipes* attaches her nest to a vertical wall. Since the cells must eventually open downward, the peduncle must be either elbow-shaped or slope diagonally downward. One can readily see that,

---

[1] The specific names were recently verified from specimens submitted to Dr. Joseph Bequaert.

[2] Ecology 10: 191–200. 1929.

[3] Psyche 35: 147–150. 1928.

since the petiole is always short, very little space for cells is available between it and the wall; hence the nest cannot grow round. Only a small proportion of the builders commit this blunder of attaching their nests to vertical surfaces. In ten years I have seen only about twenty such nests; in all but two of these, they had been abandoned as impossible before they had attained half a dozen cells. The two exceptions, however, are interesting, especially when one realizes that exceptions are often the forerunners of new habits.

One nest built on a vertical wall had, on June 17, sixteen cells, three of them sealed, and was being continued when the owner of the building destroyed the nest. Another built under this handicap was a very pretentious structure which maintained its brood during the season and in the winter following was still attached to the wall. This nest is shown in fig. 1, plate V.

As already stated, it is customary for *pallipes* to build circular nests, but this wasp, when she found that she could not build thus on account of the wall, extended the nest outward as far as she dared go on account of the weight in relation to the strength of the petiole, and then extended the sides, making the nest longer than wide. The figure shows how the nest curled upward on both sides and ended in a sort of second story on the roof at one end. There was no barrier preventing the nest from being built straight out from the wall, and the only reason that I can see for this upward curl and the two-story arrangement was that the mother or workers somehow sensed the fact that the weight must be kept balanced near the base. This surmise is justified by the fact that they had from time to time reinforced the petiole, until it was perhaps six times as thick as the peduncle of ordinary nests of that size. In this weird position, the colony had been exceptionally successful in maintaining a 168-celled nest.

Here is a combination of two mental traits, the stupidity of the queen, and the ingenuity of the workers offsetting it. In the great majority of cases, this stupid habit eliminates itself, but in this instance it has a chance of survival in the next generation. It appears probable that the blunder in beginning the nest will be repeated in this case. This habit of building abortive nests on vertical walls actually seems to occur more frequently in certain years and in certain regions than in others, as we may logically expect from the above incident. The summer of 1930 was such a year in the region south of St. Louis. More beginnings of nests on vertical walls were found than ever before. Out of 20 observed in early June, 8 were so made. It is at once apparent that these builders are either hesitating or blundering in beginning their task, for such nests usually show where the wasp has deposited a single load of paper pulp in several places near by before continuing one of them into a stem for the proposed nest. In several cases there were a dozen or more such blobs of paper stuck on the wall, and in one case I counted 48 such beginnings. This uncertainty suggested to me that either the queen must be very stupid, to be so wasteful of labor and material, or else she must feel a degree of doubt or uncertainty regarding the situation which she had chosen for her nest. These wasted lumps of paper were never seen around nests normally built on ceilings.

An unusual type of nest sometimes built by *P. pallipes* is the two-story kind. There is a corn-crib at Rankin, Mo., so built that at regular intervals two uprights are placed with spaces of about six inches between them, completely open on the outside, but boards are nailed on the back edges of these uprights. There are in this building thirty such spaces, and they must have been peculiarly attractive to *Polistes,* for twelve of them contained nests, attached just under the roof. The most interesting feature was that three such nests from last year had beneath them and attached to them the new nest for this year, with one queen in charge of each (fig. 2, plate V).

Another nest of that type was found on a September day behind a sign-board on the station at Sunnyside, 25 miles distant from Rankin. This wasp could just as easily have built her nest alongside the old one, for there was much available space. This leads one to suspect that sometimes this form is adopted from choice and not merely from necessity.

These instances also illustrate the possible beginning of the habit of making nests of several combs, one beneath the other, as *Vespa* builds them, instead of the single open comb of *Polistes.* This economy of building has not yet been adopted by *Polistes,* but these occasional occurrences point to the possibility that somewhere in the future this type of nest may become customary among them.

Polistes variatus.

Further observations again find, as previously, that *P. variatus* nest close to the ground, in pockets in dirt banks and, more often than previously recorded, in sheltered places frequented by *P. pallipes.* It seems that in certain localities *variatus* is coming more and more to adopt the ways of *pallipes,* for recently I have found their nests in old buildings more frequently than I formerly did. In fact, in one small group of buildings, I found eight nests of *variatus* and only one of *pallipes.*

A handsome nest of *P. variatus* (fig. 3, plate V) was found at the country home of Dr. Julius H. Gross, near Columbia, Illinois. This was in a pocket in a stone retaining wall, about thirty inches high. The nest was deep enough in the wall to be well hidden from view. The pocket was irregular in shape, but since it was surrounded by rocks and mortar, there was no chance for the wasps to enlarge it, as they sometimes do in soft earth, so they made the best of its possibilities. The result was the irregular shape as illustrated.[4]

The nest was large, and the adults were abundant and alert, bringing in meat for the larvae and caring for the eggs. This was in sharp contrast to those observed in other regions during the drought in 1930. The reason for this contrast is that the Illinois colony was in the Mississippi bottoms and near a spring-fed stream, where the green vegetation had supported an ample ration of caterpillars. Several cells contained large drops of clear, sweet honey. The nest contained 136 capped cells, 66 with larvae, 40 with eggs, and 12 empty, making a total of 254 cells. About 15 workers and 3 males were busy on the nest. As in other species of *Polistes,* some of the cells had been used two times. The adults, when placed in a cage, ate ravenously of honey.[5]

Another *variatus* nest was found in a spherical depression in a bank at Allenton, Mo. This nest (fig. 4, plate V) was attached by two peduncles to some fine roots, and was reasonably secure. The depression was so round and apple-like that I suspected that the wasps had assisted in making it so. Only two males and two females guarded over this nest of 109 cells, containing eggs, larvae, pupae and many drops of clear honey. Several cells gave evidence of having been parasitized. This nest offered a good example of the marked difference between *P. variatus* and *P. annularis* in the use of silk in the making of caps over the cells. *P.*

[4] In roomy pockets and when the nest is in buildings, its shape is round with the peduncle in the center.

[5] About 30 parasites identified as *Polistiphaga fulva* Cress. by Mr. R. A. Cushman emerged from his nest between Sept. 28 and 30.

variatus produces, apparently, only a small amount of silk and makes so shallow a cap that, after the emergence of the wasp, hardly a trace of it is left. In the nests of *P. annularis*, on the other hand, often nearly one fourth of the length of the cell is built up with silk spun by the larva. This *variatus* nest must have given forth a large number of adults which had deserted or died during the drought before we came upon the scene. The larvae were shrunken and half starved when the nest was discovered.

The apple-shaped pocket which contained the nest had undoubtedly been excavated, at least in part, by the wasps. That *Polistes* have the same ability to carry out lumps of dirt as do *Vespa germanica*[6] may be seen from quotations from letters from Dr. H. B. Hungerford and Dr. Carl Hartman.

"There was a nest of *Polistes* on the under surface of a rock, the rock almost touching the ground. On turning the rock over a little further and throwing in a mass of dirt as an experiment, I noticed the next day that the wasps were still at work digging out and carrying away the dirt precisely like solitary wasps, showing that the insects can in an emergency dig in the ground, an emergency which must be very rare indeed among these wasps; but this is quite a different thing from a habit which is firmly established within all of the members of a particular race."—(Hartman.)

"I was walking across a pasture on one of our farms in northern Kansas when I came upon a *Polistes* nest that had been attached to a plant stem (goldenrod, as I recall). The weight of the nest had bent the slender stem to the ground, and the wasps, in order to have access to the comb, had excavated a large, saucer-like depression in the hard earth beneath it."—(Hungerford.)

Polistes rubigenosis.

These red wasps are not so abundant hereabout as are the others, but I have found no digressions from the nesting habits previously recorded. This species likes to build in dark, inaccessible places within walls or in hollow trees. Since one is rarely able to get their nests, I describe another one here.

On September 21, at Centaur, Missouri, I found a large colony of about 30 wasps (two thirds of them males) clustered around a small hole in a shed roof about six feet from the ground. Their nest was in the dark gallery between the inner and outer layers

[6] Entom. News **41**: 185–190, 1930.

of the roof. They were lazily sunning themselves outside their door in the afternoon. In this case also the wasps had built the new nest on the edge of the old one, and had actually used the center of the old one for pulp for the new cells. In a portion of the nest the entire cells were removed, but the roof was left intact. The new cells were built on the edge of this roof, as the material was mined from the center. The nest showed evidence of having been used by at least three successive generations in as many summers.[7] The petiole on the nest was unusually thick and one and one-half inches wide. In addition there was a second stem one-half inch wide. These showed evidence of having been varnished with the black rubbery substance so often used by other species of *Polistes.* Both males and females were active, and crawled into the crack or flew away when I tried to take them.

Polistes annularis.

The nests of *P. annularis* are built in the open tree-tops, where, exposed to wind and rain, the wasps carry on life's activities. The digressions from this standard are few and slight. As I get further into the Missouri hills back of St. Louis, I find more occasions where they have taken up their abode in dilapidated buildings, which offer no better protection from the elements than do the tree-tops. On only rare occasions is an *annularis* nest attached to the eaves of a building. These digressions from custom are always worth careful scrutiny.

In the wreck of an old pioneer's cabin which figured in the days of Daniel Boone, three nests of *annularis* were found, along with several of *pallipes.* At first I was surprised to find them in this unusual situation, but closer examination revealed that the sites they had chosen were not so different from their accustomed tree-tops after all. All of these nests were on the window sashes where light and weather were about equal to that of the outside; none of the wasps had ventured far into the room. One of them had even chosen the end of a wire which protruded horizontally from a nail on the window sash (fig. 5, plate V); apparently the wasp had found in it a close resemblance to the conventional

---

[7] Nearby in this hollow space in among the material of an old rodent's nest was found the recently abandoned nest of the bumble-bee, *Bombus pennsylvanicus.* Both bees and wasps used the one entrance way.

twig. It seems that when *annularis* do build elsewhere than the trees, the old instincts still hold sway and prevent them from making a too radical change.

Here we see that on a basis of instinct, intelligence throws a pseudopod slowly and carefully and superimposes upon instinct a new habit, which in turn will probably be engulfed by instinct. Thus we can imagine a transition eventually to a line of *annularis* wasps that will follow *pallipes* in the selection of indoor, sheltered sites. One can easily see how this can come about when one remembers how persistent *annularis* queens are about coming back to the home site after hibernating, and founding their own colonies near by.[8] It was by this method that *annularis* populated Chesley Island, and it will be by this means that young queens, returning in the spring to their old home in the cabin ruins, will found their own nests there and thus develop a shelter-using clan. Thus the story of pioneering is repeated on this romantic spot; the first generation is imbued with those intangible qualities which impel it to strike out on new lines; the progeny continue life where they are born, making slight adaptations to the environment where they find themselves, merely to enhance their own comfort. Of course one wasp had to break away from habit and establish a new type of dwelling; she showed real intelligence and a true pioneering spirit. But her progeny coming after her, without inheriting these peculiar qualities but retaining a memory of the old home, build there generation after generation, until the chain is broken by some other type of queen pioneering.

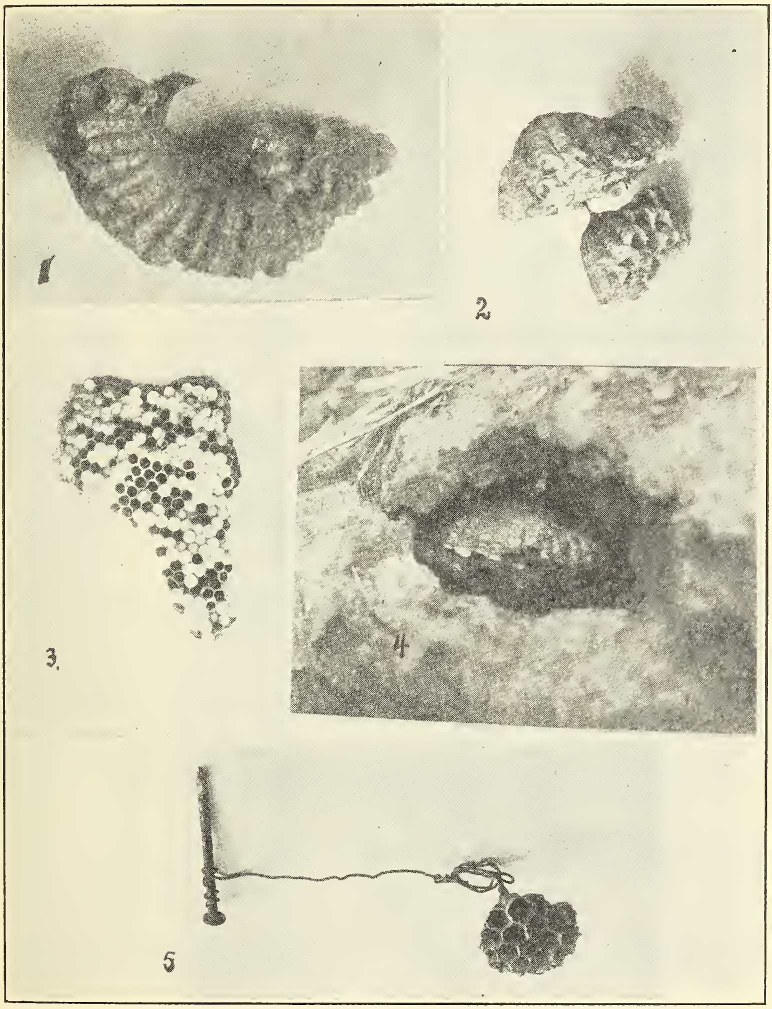
In fact, I have actually seen this to occur. Under the narrow eaves of an old club-house at Allenton, Missouri, I noticed four years ago one nest of *P. annularis.* The woods extended for miles all around this place, and houses were few, but one wasp had dared to venture on something new. Two years later, there were seven nests of this species under the eaves of this little cabin. Apparently the pioneering spirit stirs in very few, but the conservative impulse to linger near the old home dominates the great majority of the population. Only in the light of these remarks can we appreciate McCook's observations. In his popular book entitled "Tenants of the Old Farm," he illustrates (p. 430) a nest of *P. annularis* showing conspicuously the peduncle at one side of the nest; this shows that at that time (1884) and place

[8] Cf. Ann. Ent. Soc. Am. 23: 461–466, 1930; and Ecology 10: 191–200, 1929.

(New England), the form of nest differed in no wise from that of the *annularis* in Missouri in 1930. He also found them nesting in trees, and then recites the following significant narrative. On the premises of the old Springfield school stands a grove of more than a score of tall oak trees, the branches of which were thickly colonized by ringed wasps. On one tree he counted thirteen nests, and every tree was thus occupied, and several nests were hung on the blackberry vines that skirted the fence. Some nests were near the ground, and others were fifty or sixty feet above the ground. He further states that the colony had occupied the schoolhouse grounds for a half century, for men who were boys that long ago remembered it well. One can see only in retrospect the establishing of such colonies as those of Springfield and Chesley Island.

I have said that *annularis* would probably have to revert to ancestral habit if they were to go back to tree-dwelling after a number of generations had nested in the shelter of a building. This probably occurs in the various species of *Polistes,* and the following note indicates that in this case it probably did occur, even to a greater extent than that suggested above. In this case we see an *annularis* nest resembling very much the nest of the tropical *P. canadensis.* This is significant because Bequaert thinks that *annularis* is but a color form of *canadensis.* Here are the details.

At Old Mines, Missouri, on September 12, 1930, I was agreeably surprised to find a nest of *P. annularis* attached to a fence-post, near a small stream. About twenty adults were on it. If it had not been for the wasps occupying it, and the fact that *P. canadensis* is not found in this region, I should have declared it was a nest of *canadensis,* so much did it resemble it. Instead of being round or oval with the peduncle on the roof, and hanging aslant from a branch, it was pear-shaped with the stem at the top where it was attached to the post, and it hung vertically, parallel with the post, just as do many of the nests of *canadensis.* This in one case seems to be a return to the *canadensis* type of nest in a remote region.



THE ELLIPTICAL GOLDENROD GALL, ITS MAKER, AND DESTROYER.

By Wm. T. Davis, Staten Island, N. Y.

On February 25, and again on March 10, 1930, I visited the Fort Wadsworth Reservation on Staten Island, and on both occasions spent considerable time in examining the partly opened galls of the moth *Gnorimoschema gallaesolidaginis* Riley on *Solidago altissima* which I found in great numbers in an area of about seventy-five feet square. I collected one hundred and twenty-four specimens of the galls and left about as many standing. It appeared from the character of the work done, that some small mammal, presumably a mouse, had crawled up each golden rod stem and after gnawing open the lower part of the gall, had extracted the luscious caterpillar or pupa contained therein, and then departed in search of more galls to be treated in the same way.

There is a little plug, composed largely of silk spun by the mature caterpillar, in the exit hole, and as these plugs were missing in some of the galls, it appeared that in several instances at least, the depredator had made a hole at the bottom part of the gall only to find that the moth had previously escaped from the top. In a few of the gnawed galls the plugs were present, while in most there was no sign of the plug having been made near the top of the gall. This last would indicate that most of the galls had been opened in July, or at least before the larvae had made the exit orifices. Spiders in some instances had made use of the galls after they had been opened showing that the work on the galls had been done considerably before the end of warm weather in 1929. Also some of the galls had very small holes near their tops from which parasites had emerged.

It became of interest to know if the mouse or mice would return to the golden rods in the summer of 1930 and renew their operations of extracting the immature *Gnorimoshema,* or whether they would fail to put in an appearance and allow the moths to emerge, except as they might be affected by insect parasites.

With this object in view the patch of golden rods was visited a number of times during the summer, and as the season advanced many galls were collected or opened when they became hard and more fully grown. On July 21, for instance, I found that the larvae had not transformed to pupæ, though they had prepared the exit holes, and the galls were quite hard. A week later, on July 28, I cut open more galls and found that the caterpillars within had in each instance changed to a pupa. On August 4 I found that at least one moth had emerged, and by September 3, a great many had emerged, and I noted that about one half of them had hatched.

Meanwhile I had collected many galls from which the moths and parasites had emerged in breeding cages. Near the patch of *Solidago altissima* there were a few plants of *Solidago serrotina* which bore a number of galls of a somewhat more robust growth. The moths that came from them were also somewhat larger than those from *Solidago altissima.* It may be here stated that until a few years ago, the golden rod on which *Gnorimoshema* usually deposited its eggs in the vicinity of New York City, was known as *Solidago canadensis,* which species, however, is now assigned by botanists to a more northern habitat in New York state.. A similar gall is to be found on the Sea-Side Golden rod, *Solidago sempervirens,* made by *Gnorimoschema solidaginella* Kearfott. The writer has also raised *Gnorimoschema gallaeasteriella* Kellicott, from *Solidago latifolia,* collected at Ithaca, N. Y., August 12, 1928.

It will be noted from the foregoing that during the summer of 1930 the Elliptical Goldenrod galls were not molested by rodents in the Reservation at Ft. Wadsworth; they perhaps had forgotten, died or moved away.

It may be stated that there are no red squirrels on Staten Island to open galls, they could have been opened by gray squirrels, but even the most slender stemmed plants of *altissima* had not, apparently, been broken down in 1929. We have, however, often found the Oak-Apple Galls made by *Amphibolips confluens,* opened by gray squirrels, as recorded in the Bulletin of the Brooklyn Entomological Society for June, 1924, pp. 91–93. This squirrel also opens acorns for the *Balaninus* larvae within, often cutting them from the trees in great numbers while in quest of the larvae.

In the *Journal* of the N. Y. Entomological Society for June, 1922, Dr. R. W. Leiby has an illustrated article on the Biology of the Goldenrod Gall-maker, and shows that the adult moth "appears in late summer or early fall, deposits its eggs and then dies.

The insect hibernates in the egg stage. The eggs hatch about May 16, the larvae crawling to the new goldenrod shoots and developing in galls." Dr. Riley (1869) had supposed that the moths hibernated, but this probably does not occur. Dr. Leiby also points out that in Vermont *Gnorimoschema* takes about half as much time to go through its changes from newly emerged larva to adult than it does under the warmer conditions prevailing in North Carolina.

The above mentioned paper also gives some account of the polyembryonic development of the parasite *Copidosoma galechie* How., where "an average of around 165 individuals of the parasite are developed in one larva from one parasite egg."[1] As mice eat the small larvae in *Rhodites radicum,* the root-gall of the rose, as well as other small gall makers, they would eat the common *Copidisoma* as well as *Gnorimoschema.* We found no instance where galls had been but partly opened and then abandoned on account of their contents.

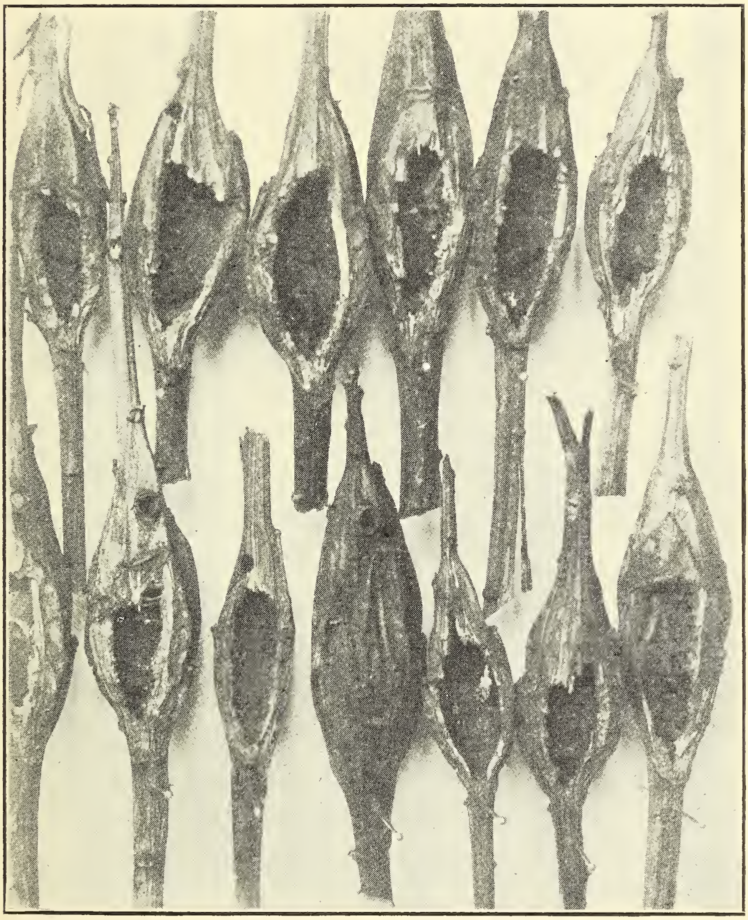
Holes are sometimes drilled by woodpeckers into the "Round Gall" or "Ball Gall" of the goldenrod, caused by the fly *Eurosta solidaginis Fitch.* The writer has found *Eurosta* galls thus opened, and in the Pomona Journal of Entomology and Zoology, September, 1915, Dr. Chi Ping states that "occasional galls will be found in late season drilled by woodpeckers or gnawed open by small rodents." Both the larvae and pupae of *Eurosta* winter in the galls, according to Dr. Ping, and so for that reason they are sought for in winter by woodpeckers and mice.

Explanation of Plate VI.

Galls gnawed open before larvae had matured; three galls opened after larvae had prepared exit, and one ungnawed gall from which adult moth had emerged.

---

[1] See also *Journal,* N. Y. Ento. Soc., December, 1923, p. 194.



TWO NEW SPECIES OF HEZA FROM CUBA (HEMIPTERA-REDUVIIDAE).

By S. C. Bruner, Santiago de las Vegas, Cuba.

Since the last contribution[1] on the Cuban Reduviidae was published two additional species of the genus *Heza* have come to hand, neither of which appears to have been described. The number of known species from this Island is thus increased to four, the largest number yet reported from anywhere in the West Indies. Champion records only three species from Central America, the bulk of the known forms being South American.

The writer gratefully acknowledges his indebtedness to Mr. H. G. Barber for the loan of specimens from the collection of the National Museum and for other generous assistance.

Heza angustata n. sp.

A rather slender bright reddish testaceous species with a very small blunt spine on the outer apical angles of abdominal segments 1 to 3 and the anterior lobe of the pronotum unarmed.

Male.—Form moderately elongate and slender. Head about three-fourths as long as pronotum, the anterior and posterior lobes subequal in length, the latter seen from above gradually narrowed behind to slightly more than one-half greatest width in front; ocelli large, well elevated; the two post antennal spines suberect, rather short, about one-half as long as vertical diameter of eyes; eyes very large; juga conically elevated at apex; rostrum with segment 1 about as long as segments 2 and 3 combined. Antennae long, linear, segment 1 longest and reaching behind apex of scutellum, shorter than 2 and 3 combined, segment 2 shorter than 3 which is more than twice as long as 4, the latter extending for about full length behind apex of abdomen; segment 1 bare, others with very short rather thin pile. Pronotum slightly longer than wide; anterior lobe unarmed, glossy, about two-thirds the length of posterior lobe, sculptured, anterior lateral angles rounded, a longitudinal dorsal sulcus, this more prominent behind and on each side of which is a rounded elevation; posterior lobe rather coarsely and densely punctate, the four dorsal spines long, stout, of equal length,

[1] Annals Ent. Soc. Amer., Vol. XIX (1926), 247–251.

posterior margin before scutellum very shallowly concave. Scutellum with median depression behind base and a sulcus on sides from base to behind center, apex bluntly pointed. Hemelytra slightly surpassing apex of abdomen. Abdomen narrow, connexivum not exposed; segments 1 to 3 armed on outer apical angles with a minute blunt spine, this stronger on segment 1; apical angles of segment 6 with a small tooth-like prominence. Beneath minutely and thinly pubescent. Legs normal, anterior femora somewhat incrassate, these as well as anterior tibiae and trochanters covered below with dense growth of fine stiff erect hair, about one-third as long as diameter of femora; legs elsewhere with scattered longer fine pale hairs, the apical half of tibiae pilose. Prosternum rounded in front. Tubercle on mesopleura small but distinct. Hypopygium longer than broad, apical margin produced into slender process curving upwards; claspers long, slender, curving upwards and projecting slightly behind apex of abdomen (Fig. 3), clothed with thin yellowish hairs.

Color bright reddish testaceous, paler below; portion of sixth abdominal and genital segments fusco piceous; veins of membrane largely infuscated; intermediate and posterior femora fading to greenish yellow towards base; apical half of scutellum and veins of corium pale.

Length 14.5–15 mm., width at shoulders 2.75 mm.

Type: Male, Las Animas, Sierra Rangel, Pinar del Río Province, elevation, 1500 feet, August, 1930; Hermano Roberto, Colegio "La Salle," collector; deposited in the U. S. National Museum, No. 43568. *Paratype:* Male, from the same locality, April 3, 1931; A. Otero and J. Acuña, collectors (reared from nymph); in collection of H. G. Barber.

This insect does not appear to be very similar to any of the described species of the genus. In general facies it resembles the male of *Heza similis* Stål but differs particularly in having the anterior lobe of the pronotum unarmed posteriorly, in the presence of the small blunt spine on abdominal segments 2 and 3 and in the distinct coloration.

Heza havanensis n. sp.

A moderately large pubescent fuscous and testaceous species having segments 1 and 2 of the antennae annulate, the first five segments of the abdomen armed with a distinct spine on the outer apical angles, the fifth and sixth strongly produced and dilated, and the anterior lobe of pronotum provided behind on disc with two minute tooth-like tubercles, scarcely differentiated. This species also has strongly elevated spiracles, prominent juga, and the basal segment of the rostrum slightly longer than the second and third combined.

Male.—Form rather narrow with sides subparallel except towards dilated apex of abdomen. Head about three-fourths length of pronotum, the anterior and posterior lobes subequal in length, the latter seen from above with sides subparallel, only slightly narrowed posteriorly; the juga prominent at apex as rounded elevations; ocelli large; the two post antennal spines very erect, slightly curved, somewhat shorter than vertical diameter of head. Eyes of moderate size. Rostrum with segment 1 slightly longer than segments 2 and 3 combined. Antennae with segment 1 reaching to apex of scutellum, clothed with few scattered erect hairs (other segments missing). Pronotum about as broad as long, the anterior lobes with lateral angles armed with a prominent obtuse conical tubercle, the disc provided posteriorly with two minute, scarcely distinguishable tubercles on rounded elevations, surface considerably sculptured but otherwise smooth except for scattered patches of ashy pubescence; posterior lobe closely punctate with scattered patches of ashy pubescence, the four dorsal spines long, stout, very sharp and of approximately the same length, posterior margin before scutellum shallowly concave. Scutellum with deep median impression in front, then elevated, depressed strongly at apex and sides, pubescent; apex rather sharply pointed. Hemelytra attaining apex of abdomen; quadrangular areole relatively broad; corium finely pubescent. Abdomen with connexivum not exposed except towards apex where the fifth segment is considerably dilated; the apical angles acutely produced and directed backwards, the apical angles of the sixth segment also dilated and produced into an acute point projecting on either side slightly beyond hemelytra; segments 1 to 5 armed with well developed sharp spine on outer apical angles; spiracles large, strongly elevated, visible from above (in dried specimen) on segments 2 to 4. Beneath rather evenly clothed with ashy, appressed, rather coarse pubescence. Legs relatively short and stout; anterior and intermediate femora slightly incrassate, surface somewhat uneven; legs thinly clothed with long thin dark hairs, more abundant on tibiae which are also pilose towards apex. Prosternum somewhat angularly prominent in front. Plica on sides of mesosternum distinct, well elevated. External genitalia of usual form, the claspers very short (Fig. 4).

Color light dull brownish fuscous varied with testaceous. Head fuscous; antennae with basal segment fuscous broadly annulated with three flavescent bands (the remaining segments missing); most antennal spines paler at apex; rostrum with segment 1 and part of 2 testaceous. Thorax light fuscous, the elevated areas fading to testaceous, apical half of posterior dorsal spines of pronotum flavescent. Legs flavescent and fuscous brown; the femora marked with uneven longitudinal fuscous streaks and lines, these confluent in front, the posterior femora with indefinite bands; the (anterior? and) intermediate tibiae largely fuscous with irregular longitudinal flavescent markings on posterior side; the posterior tibiae largely fuscous, the base and incomplete ring on basal third testaceous; tarsi fuscous. Hemelytra largely flavotestaceous, the membrane pale brownish, irregularly spotted with fuscous, markings confluent along vein from costal areole, forming conspicuous dark vitta to apex. Abdomen below dull greyish fuscous.

Female.—Much larger and more robust than male. The antennae are relatively shorter, the first segment barely attaining hind margin of prothorax; segment 2 with one broad flavescent band, clothed with rather short hairs; segment 3 (and 4?) entirely flavescent, clothed with fine pale pubescence. The head appears slightly broader posteriorly as seen from above and the eyes much smaller than in the male, only about one-half greatest depth of head. The two very small tubercules on the disc of the anterior lobe of pronotum, which are nearly obsolete in the male, are somewhat more distinct. The quandrangular areole of the hemelytra is broader, less than twice as long as broad. The connexivum is narrowly exposed, much more so posteriorly, the segments dull fuscous in color, with an indefinite macula through the center of each and apex of spines testaceous; the spines on the apical angles are stouter, and the fifth and sixth segments are much more stronger dilated behind, rounded and more obtuse. The legs are paler, the dark longitudinal streaks more definite, and there are no distinct annulations.

Length, male, 13 mm., width at shoulders 2.5 mm.; female, 18 mm., width at shoulders 4 mm.

Type: female, Almendares River, Havana, Cuba, August 6, 1930, C. G. Aguayo, collector. *Paratype:* male, "Cuba," P. R.

Uhler collection. Type, No. 43569, and paratype in the U. S. National Museum.

The male which I have made a paratype was evidently sent to Uhler by the late Dr. J. Gundlach as it bears the number 259 which in the list in the manuscript notebook of Gundlach, now preserved at the National University in Havana, corresponds to "*Heza acantharis* Lin.," a name also placed on this specimen by Uhler. How this mistake occurred is not easily understood as the true *acantharis* is very different as will be seen later. Gundlach also had specimens of *acantharis,* presumably determined by Uhler (as were most of his Hemiptera) but these are placed under another number (118). Gundlach's number 259 (*havanensis*) is recorded as taken at Cárdenas (Matanzas Province) and Rangel (Pinar del Rio Province). Thus the known distribution of this species is the western half of Cuba.

From the short description given by Stål this species would appear at first sight to be rather closely related to *pulchripes* of Porto Rico. I am indebted to Mr. H. G. Barber for the opportunity of examining an *Heza* from the Island determined by him as *pulchripes* of Stål. Except for the absence of annulations on legs and antennae this specimen, which is a female, agrees with the original description. When directly compared with *havanensis* it is seen to be strikingly different. In the Porto Rican species there is a very small spine on the first abdominal segment, an almost obsolete, minute, very obtuse tubercule on segments two and three and a more distinct but small obtuse tooth-like tubercle on the remaining segments. Stål in describing *pulchripes* states "*segmenta 1* (*et 2?*) *abdominis extus apice spinula armata.*" This definitely excludes *havanensis* which has sharp, well developed spines on the first five segments in both sexes, and the remaining segment with the apical angles strongly produced, and in the male spine-like. As in the present species, *pulchripes* has the abdomen broadest at the apical angle of the fifth segment, which is considerably dilated, but unlike *havanensis* the sides of this segment are not rounded and the apex is not directed backward but outward. The female is also more slender with longer legs and antennae. The disc of the anterior lobe of prothorax of *pulchripes* is armed with two short but distinct spines posteriorly which are barely distinguishable in *havanensis* and the body is covered with much more conspicuous pale pubescence, this forming a white patch on the apex of scutellum; furthermore the basal segment of the powerful rostrum of *havanensis* is slightly longer than segments two and three combined while on *pulchripes* it is slightly shorter.

The various species of the genus *Heza* as recognized at present show great diversity in structure, and it is not a very homogeneous group. The four species now known to occur in Cuba may be readily separated by the following key:

KEY TO THE CUBAN SPECIES OF HEZA.

1. First five or more abdominal segments armed with spine on outer apical angles, or the latter more or less acutely dilated and produced, spines well developed, stronger on posterior segments 2

   First three abdominal segments only armed with spine on outer apical angles, spines very weak, stronger on basal segment; apical angles of sixth segment with small tooth-like prominence; post antennal spines in male short, much shorter than diameter of eyes, joint 1 of rostrum about as long as 2 and 3 together; slender, nearly bare species (L., male, 15 mm.) .... **angustata** n. sp.

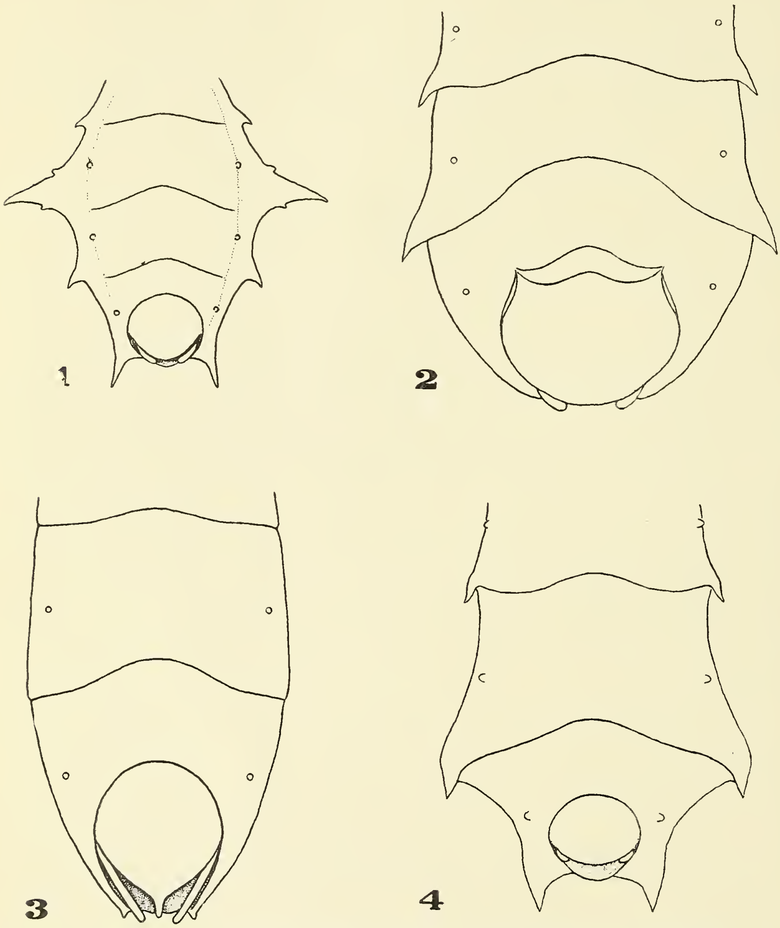
2. First five abdominal segments armed with strong sharp spine on outer apical angles; apex of abdomen rounded joint 1 of rostrum distinctly shorter than joints 2 and 3 together; body finely clothed with very minute silky pubescence; moderately large and stout species of normal form (L., 14–17 mm.) *acantharis* Lin.

   Six abdominal segments armed with spine, or outer apical angles produced as more or less acute flattened point..... 3

3. Abdomen broadest at fourth segment where apical angles are produced into very large spine directed outwards which in turn is armed on either side above base with a small tooth; pronotum with anterior lateral angles rounded, disc of anterior lobe unarmed behind; juga not elevated; joint 1 of rostrum as long as joints 2 and 3 together; small bare species (L., 10 mm.) .... *clavata* Guérin.

   Abdomen broadest at fifth segment where apical angles are dilated (more so in female) and produced into point directed backwards; anterior lateral angles of pronotum with large conical tubercle, disc of anterior lobe armed behind with two minute teeth or tubercles (at least in female); joint 1 of rostrum slightly longer than joints 2 and 3 to-

gether; juga elevated; larger ashy pubescent species with two basal segments of antennae annulated and abdominal spiracles strongly elevated (L., 13–18 mm.)
havanensis n. sp.



Cuban species of *Heza:* apical half of abdomen from below. 1. *H. clavata* Guérin. 2. *H. acantharis* Lin. 3. *H. angustata* n. sp. 4. *H. havanensis* n. sp. The hairs are not represented.

PSAMMOCHARIDAE FROM YUCATAN.

By Nathan Banks.

During a short visit to Yucatan, Dr. Joseph Bequaert collected a number of these stinging wasps. In the 'Biologia Centrali-Americana' Cameron has recorded a number of species from Yucatan collected by Dr. Gaumer. Those taken by Dr. Bequaert are largely different, probably due to their having been collected in a different part of the State. All the specimens are at the Museum of Comparative Zoölogy, Cambridge, Mass.

There are two other species in the collection unidentified, one a very small *Batazonus,* a male, the other a male *Ageniella* which might belong to one of several recorded by Cameron.

Notocyphus minimus sp. nov.

Male.—Black, with some white marks. Clypeus, a narrow stripe two-thirds up inner orbits, lower side of basal joint of antennae, hind border of pronotum, a spot each side below this, and another spot each side on middle of front edge of pronotum, tegulae, a large spot each side on basal part of third abdominal segment, the last segment, and lower genital plate, all white. Front tibiae and tarsi pale yellowish; spurs brown, wings hyaline, unmarked. Head, thorax, coxae, femora, and part of abdomen with white pubescence, particularly strong on posterior part of the propodeum. Face long and narrow, eyes converging below, lateral ocelli nearer to eyes than to each other; pronotum arcuate behind; legs almost spineless, mid and hind tibiae with extremely short and minute spines, long spur of the hind tibia over one-half of the basitarsus. In the fore wings the basal vein is rounded basally, outer side of radial cell curved, second and third cubital cells subequal, narrowed above, the third more than the second; the first recurrent vein ends at basal third of cell, the second recurrent at middle of cell.

Length, 3.5 mm.

From Chichen Itzá, Yucatan, 29 June (*Bequaert.*)

Separate by minute size, pale, unmarked wings, and lack of spots on scutellum and postscutellum.

Planiceps bequaerti sp. nov.

Female.—Black; thorax, abdomen, and wings purplish in certain lights; body mostly with short appressed hair and few longer erect ones on head; clypeus broad, evenly rounded below; basal joint of antennae longer than third or fourth; ocelli in low triangle, laterals much farther apart than from eyes; front femora much swollen, tibiae rounded, not flattened, with a few very short spines on outer side, mid and hind tibiae with spines mostly in rows; long spur of hind tibiae less than one half of basitarsus; propodeum evenly rounded, a basal median groove, an impressed point each side behind spiracle; abdomen very sparsely hairy at tip and beneath, fully as long as thorax. Wings reaching but little beyond middle of abdomen, first recurrent ending before middle of cell, second recurrent ending plainly beyond the cell, the second cubital cell over one and a half times as long as high, radial cell pointed at tip, fully its length from tip of wing, basal vein interstitial, lower part bulging toward base.

Length, 10 mm.

From Chichen Itzá, Yucatan, 29 June (*Bequaert.*)

Pedinaspis alternata sp. nov.

Male.—Black; clothed with much gray hair, densely on the lower face and somewhat above the antennae, above this some fine white pubescence each side and also on occiput; basal joint of antennae, legs (except tarsi), front and sides of pronotum, patches each side and behind the scutellum, the apical half of propodeum, most of pleura, basal half of first and second abdominal segments, and apical portions of the following ones with pale gray pubescence. Wings mostly hyaline, infuscate toward apex, veins and stigma black. Eyes much converging below, vertex very broad and strongly convex; clypeus almost truncate in front; ocelli in a very broad triangle, laterals about as near eyes as each other; pronotum elongate, arcuate behind; propodeum also elongate, nearly flat, the posterior angles extended; mid femur with small spine at tip, mid and hind tibia strongly spined, long spur of hind tibia more than one-half of basitarsus. Fore wing with a pointed radial cell, second and third cubital cells both narrowed above, the third somewhat the larger, first recurrent ends beyond middle of cell, second recurrent (an even curve) ends at middle of cell, basal vein almost interstitial.

Length, 10 mm.

From Chichen Itzá, 29 June (*Bequaert*).

Of the general structure of *P. magnus* of Texas, and like in that species the female is probably quite different in appearance.

Psammochares neotropicalis Cameron.

One from Chichen Itzá.

Pompiloides subargenteus Cresson.

One from Chichen Itzá.

Episyron exactus Cameron.

Several from Chichen Itzá.

Episyron temaxensis Cameron?

A male from Chichen Itzá I place to this species with some doubt; the type was a female. This male has two interrupted bands on the abdomen and the hind tibia are white at base as in *E. torolae,* but the ocelli agree better with *temaxensis* and the wings are dark only at tip. In *Episyron* it is common to have the abdomen more spotted in male, and the hind tibiae more pale at base. In this specimen the third cubital cell is lacking, but this is not impossible, and otherwise it is an *Episyron.*

Batazonus balteolus Cameron?

Several from Chichen Itzá are darker than the types, but probably belong here; structurally they are similar to *B. flavopictus.* In these specimens the venter is entirely black.

Arachnophroctonus virulentus Smith.

Two from Chichen Itzá; common in Central America.

Pseudagenia mexicana Cresson.

One from Chichen Itzá; widely spread in Central America.

Ageniella persimilis sp. nov.

Female.—Closely related to *A. accepta* Cresson, of the same ferruginous color, the dark bands on the wings the same, venation the same, face, clypeus, antennae and legs the same, the long spur of hind tibia one third of basitarsus as in *accepta.* The ocelli, however, are in a much broader triangle, the laterals being about as near to the eyes as to each other, and distinguished especially from *accepta* by having numerous fine, but perfectly distinct transverse ridges on the propodeum, occupying all of the area from just behind the spiracles to almost the tip. There is no sign of the black marks each side of scutellum and postscutellum which are usually seen in *accepta.*

Length, 7.5 to 8.5 mm.

From Chichen Itzá, Yucatan, 29 June (*Bequaert*) and one from Los Amates, Guatemala (*Kellerman*).

Ageniella maya sp. nov.

Male.—Black; face, basal joints of antennae, much of thorax, coxae, and part of abdomen with silvery pubescence. Clypeus with a pale spot each side; palpi pale; last segment of abdomen white above, basal segment rufous at tip, with extension each side; legs with all femora reddish, front tibiae and tarsi also pale, spurs snow white; wings hyaline, extreme tip of fore-wings distinctly black. Clypeus truncate in front, ocelli in a fairly long triangle, laterals plainly nearer to each other than to eyes; vertex convex; eyes converge below; pronotum angulate behind; propodeum with deep median groove; abdomen slender, first segment slender, petiolate, its lower edges extending below. In the fore-wing the second cubital cell twice as long as broad, much narrowed above, third cubital cell much shorter, as high as long, somewhat narrowed above; the first recurrent vein ends at the basal third of cell, the second recurrent before middle of cell; rádial cell rather long and pointed as in *A. calcarata.*

Length, 8 mm.

From Chichen Itzá, Yucatan, 29 June (*Bequaert*).

By its white spurs it appears near to *A. calcarata,* or variety *accola;* but there is no white border to the pronotum, and the shape of the basal segment of the abdomen is quite different from that of *calcarata,* much more like that of *petiolata.* In *azteca,* which is somewhat similar, the radial cell is of different shape, and there is less red on the legs.

Blue Berries as Carriers of the Japanese Beetle.—A quart box of blue berries, bearing the label "New Lisbon, N. J.," and purchased at Hartsdale, N. Y., on August 11, 1931, contained two specimens of the Japanese beetle, *Popillia japonica,* one under the cellophane paper cover and the other well hidden among the berries at the bottom of the box. To the writer's knowledge the Japanese beetle as yet has not established itself in the region of Hartsdale, N. Y. However, this record points to one of the many avenues of introduction, not easily controlled.—Geo. P. Engelhardt, Hartsdale. N. Y.

HETEROPTERA COLLECTED BY G. P. ENGELHARDT IN THE SOUTH AND WEST—II.

By J. R. de la Torre-Bueno, White Plains, N. Y.

I

The following records of distribution of Heteroptera I owe to kindness of my friend Mr. George P. Engelhardt, who takes time on his trips to collect these insects, which he turns over to me. His material taken in 1927 and 1929 was published in this Bulletin,[1] and these present records seem to be either additions to the fauna, or else new localities for the species.

At Royal Palm Park, Florida, on November 18, 1930, he secured the following species:

Lygaeus mimulus Stål—One specimen of this species, known from Florida and Texas; heretofore reported thence by Dr. Blatchley.

Ligyrocoris multispinus Stål—One specimen. This was described from Mexico and has been recorded from Florida, but not from this locality.

Orthoea longula Dallas—Also a single specimen of this Neotropical form, which is widely distributed in Florida, as says Blatchley, although he names no specific localities.

Orthoea servillei Guérin—A single specimen of this rare species, found also in Mexico and recorded from Blatchley from Royal Palm Park.

Ptochiomera minima Barber—There are two specimens of this species in the lot. It was described from Cuba and is known also from Louisiana, Florida and Texas. This is a new record for Florida.

Ozophora binotata Barber—Only one of this Floridian species, already known from this locality.

Peritrechus paludemaris Barber—This seashore species is represented by one specimen. It is known from Massachusetts to Florida and has been taken at Royal Palm Park.

---

[1] Vol. XXV, pp. 107–108, April, 1930.

Phymata fasciata Gray—There is only one Florida record of this species, which occurs (presumably) from New Jersey to Mexico. This is a new locality in Florida.

Mesovelia bisignata Uhler—This common and widespread Eastern species is represented by 20 specimens. It does not appear to have been recorded from Royal Palm Park before, even under the name *mulsanti* B. White.

Saldula interstitialis Say—Two specimens of this widespread species, which has already been recorded from this locality.

In addition there are 2 specimens of an unidentified *Microvelia* near *americana* Uhler; five specimens of an unidentified *Gelastocoris;* and one *Corixa.*

The ten identified species represent four new records for the State; and the remainder are confirmatory. It seems a pity that in spite of much recent work in the groups, it should not be possible to fix the other three specifically.

2

The material from Texas is very interesting, as the following records indicate:

Platycarenus clypeatus Stål—At San Antonio, October 2, 1930, Mr. Engelhardt secured seven specimens of this by digging at the roots of *Clematis.* Its European counterpart, *Sciocoris,* is likewise found at the roots of plants, but this is the first record of the habitat of our American form. This is the second authentic record of this Mexican species for United States, the first being by Barber from Brownsville, Texas.

Brochymena 4-pustulata Fabr.—One from Alpine, October 2. According to Blatchley, this species ranges from Quebec to California, Utah and Arizona, although Van Duzee does not cite it from Texas. This is probably a new record from the State.

Chlorochroa uhleri Stål—This widespread species is represented by 7 specimens from Alpine, October 2. Van Duzee's catalogue does not mention it from Texas, but Blatchley says it is known from Quebec to Mexico—inferentially from Texas. This is probably a new record from the State.

Thyanta casta Stål—This species described from Mexico is represented by four specimens from Alpine, October 2.

Murgantia histrionica Hahn—This widespread species is represented by one specimen from Alpine, October 3.

Perillus bioculatus Fabr. var. *clanda* Say—Blatchley states this is found from Ontario to New Mexico and Arizona, although Van Duzee does not give it as found in Texas. One specimen from Austin, October 24, 1929.

Narnia femorata Stål—Seven from Alpine, October 3, which seems to be a new record.

Mozena lunata Burmeister—One specimen from Alpine, October 3. Heretofore recorded from Brownsville by Dr. Snow and H. G. Barber; a new locality.

Anasa tristis DeG.—Four from Alpine, October 2, of this species which ranges from Quebec to Brazil.

Hypselonotus lineatus Stål—There are two specimens of this species in the lot, from Austin, January 1, 1929. This species does not seem to have been recorded from the United States heretofore, although Van Duzee lists *H. fulvus* var. *venosus*, fide Banks.

Jadera haematoloma Stål—One from Ft. Davis, a new record of this well-known species.

Oncopeltus fasciatus Dallas—One from Ft. Davis, October 7, and another from Alpine, October 2; both seem to be new records for the State.

Lygaeus kalmii Stål—Alpine October 2; another new record.

L. facetus Say—One specimen from San Antonio, October 2; a widely distributed species from New Jersey to Texas.

Euryophthalmus succinctus Linnaeus—One specimen from Ft. Davis, October 7.

Phymata fasciata Gray—Six from Alpine, October 2, and one from San Antonio, same date. A common and widespread species, of which these are probably new records for the State.

Triatoma sp., nymph—San Antonio, October 2.

Hammatocerus purcis Drury—Bexar, one on August 5, 1928; a new record.

Zelus bilobus Say—San Antonio, October 2, one ♀.

Zelus cervicalis Stål—Alpine, October 2, 1930; Austin, January 24, 1929. One on each date. These two appear to be new records.

Gerris remigis Say—Two from Alpine, October 2; and two from Ft. Davis, October 7. These are probably new records.

Notonecta lobata Hungerford—Five from Ft. Davis, October 7. This is a new record for this species.

Arctocorixa abdominalis Say—Alpine, October 2. This is the common Mexican species, already known from Texas, although this is a new State record.

In addition to these records, there are several unidentified land and water bugs, which will be reported on later.

3

The following are specimens taken at other places:

Euryophthalmus succinctus Linnaeus—Eight from Chula Vista, California, September 3, 1930.

Diolcus chrysorrhoeus Fabr.—One specimen from Chickasaw, Mobile, Alabama, September 21, 1930. This species does not appear to have been reported from the State before.

Brochymena myops Stål—Two from Biloxi, Miss., October 13, 1930. This is a widespread species. for which this is a new record.

Murgantia histrionica Hahn—Biloxi, Miss., October 13, 1930. Van Duzee does not record it from the State, so this is likewise new.

Zelus bilobus Say—A pair in cop., Biloxi, Miss., October 13, 1930.

It seems strange that so many well-known species, many of them widespread, should be here recorded for the first time. But it should always be borne in mind that the abundance of Heteroptera, as it has been put, corresponds pretty exactly to the abundance of Hemipterists; and their distribution is in the same ratio.

In working up this small lot, the writer was confronted with the usual difficulty in the absence of general works in many of these groups. In order to identify many of these insects, particularly those left unnamed, it becomes necessary to consult isolated specific descriptions, which, in the elementary and extremely terse older writings leave much to be desired, and perhaps as much to the imagination. Monographic work, of course, is difficult, particularly when it becomes practically impossible to control species by the older descriptions, but until this is adequately done, many identifications become mere aspirations, which have been avoided in this writing. Distributional records also are of the most fleeting kind; and many of them have been published in literature of small circulation, much of which is unknown or forgotten. For example, it scarcely seems likely that so common a pest of the Cruciferae as *Murgantia histrionica* should not be recorded from Mississippi, but no records of it seemed to be in being.

It is to be hoped that some time someone may feel called upon to make easy the way of his fellows by clearing up these obscurities by publishing synopsis and other aids to identification. We sorely need them.

Cicindela unipunctata Fabricius in New York State.—This species is recorded by Leng in "A List of the Insects of New York" (Memoir 101, Cornell Univ. Agr. Exp. Sta., 1928) from Ft. Green, Bronx Park, and Brooklyn, followed by the statement, "The records for this species are few and ancient and do not clearly indicate it as an inhabitant of this State."

The apparent scarcity of this easily-recognized tiger-beetle seems to warrant the record of the capture of a single specimen at Oswegatchie, N. Y., July 5, 1931, by my wife and myself. It was taken in a large clearing in a woodland area along the Little River, where the ground was strewn with fallen leaves.

The species, in my experience, takes to wing less readily than most others of its genus, flies only a few feet at a time, and is inclined to secrete itself under débris. Its modest coloration is highly protective, and seems to give the species confidence that it will be overlooked.—J. Douglas Hood, University of Rochester.

EDITORIAL.

ON HELPING THE EDITOR.

Every well-conducted and constitutional editor, if normal, is rejoiced in the help received from contributors. Manifestations of coöperative assistance are met more than halfway—generally with a *dele.*

We know that all our friends—and that means YOU, dear contributor—are ever ready to make our job one long pleasaunce. In our own helpfulness, we venture here to most diffidently suggest a few very simple and effortless ways to make smooth our rocky road.

Item—All contributions are best typewritten.

Item—Contributions should be written on one side of the paper only. (Linotype operators, in their necessary speed, are apt to forget to turn over a sheet, thus producing delicious *non sequiturs.*)

Item—All contributions should be typed in double space. This makes interlineations more legible.

Item—There should be a 10-space margin at the left, so that editor may have room for *his* notations.

Item—All names should be carefully checked. This editor publishes them as received; and washes his hands of all guilt in the matter.

Item—Contributions are hopefully expected to be complete and perfect when received. If any author feels the urge to rewrite or improve his article after it is in type, he should bear in mind that it is costing him at the rate of $2.50 per hour for his pleasure (compositor's time). We are charged for this, and our financial exiguousness compels us to pass it on, sadly but firmly.

Item—We appreciate the labors of our friends who kindly mark MSS. for us. Sometimes it saves us cerebral wear and tear; and at others, it's a sad case of love's labors lost. This adds to the burden of our editorial griefs, heavy enough, the gods wot.

In brief, we urge our contributors to be as entomologically perfect as the perfectible nature of man permits. That will make us all happy.

J. R. T.-B.

BOOK NOTES.

Recent Advances in Entomology, by A. D. Imms. Pp. i–viii 1–374, figs. 1–84. (P. Blakiston's Son & Co., Inc., Philadelphia, $3.50.)

It is evident to any one acquainted with the enormous mass of entomological works and publications appearing from day to day, that there is great activity in this branch of biological science on the philosophical side—that is, on the side of integrating the multitude of observed facts about insects accumulated in the last decade. This activity is taking the study of insects, in the broad sense, out of the realm of empiricism into the state of coordination into an integrated science, to become, as it should, a fertile source of biological data to elucidate the problems of life, its origin, manifestations and mechanism.

In this work Dr. Imms sets himself the task of correlating and classifying the enormous mass of facts and theories, and of bringing them into relation with each other, in the light of our present knowledge and hypotheses.

The fifteen chapters of this book discuss the latest aspects of morphology; the current theories of metamorphosis; palaeoentomology, particularly in the light of phylogeny; sense organs and reflex behavior, including receptor organs of chemical stimuli; the fundamental aspects of coloration; some aspects of ecology and its practical applications to insect control; parasitism in its main aspects; and the biological control of insects, mainly by parasitism. In addition to the general index there is also an index of the authors cited.

In the account of paleontology, one misses Dr. G. C. Crampton's views on the alleged status of *Eugereon boeckingi,* in regard to which Dr. Imms sets forth the accepted (and to the writer's mind, highly questionable) views. Whatever the highly specialized beak of this fossil may seem to indicate, its thoracic and, particularly, its venational characteristics, might seem to remove it very far from the Hemiptera ancient and modern known to us—as Dr. Crampton points out at length.

In future editions of this valuable and useful work, *Perillus bioculatus* should be referred to the asopine pentatomids, where it belongs, and not to the Reduviidae, to which it is attributed by some *lapsus calami.*

Each chapter has extensive citations of the pertinent literature which, in the nature of the work, is of the more important papers and books known to the author; and which, obviously, could not be made complete and kept within bounds. Incidentally, we note a complete absence of any citations, either from this BULLETIN or from *Entomologica Americana* in which some new work on phylogeny has appeared.

Doubtless, an appraisal of the conclusions in this work may show differences of opinion as to the proper weighting and evaluation of all factors set forth, but nevertheless we have here a most useful compendium bringing into one compass a vast mass of literature, otherwise hard to get at in its entirety. It complements Dr. Imm's own "General Textbook of Entomology" and Dr. Comstock's "Introduction to Entomology." It demands a place in the library of every entomologist who has progressed beyond the descriptive phase of the science. J. R. T.–B.

The Butterfly and Moth Book—Revised and Enlarged, by Ellen Robertson Miller—pp. 1–xxi + 1–285, with over 200 drawings and photographs. (Charles Scribner's Sons, New York, $2.50.)

This is an enlarged edition of the 1912 publication. In its forty-two chapters it discusses briefly and simply the life histories and other details of the habits of a number of our common and easily seen butterflies on the summer flowers of the fields and of the moths around lights at night. The species studied can readily be recognized by the excellent photographs in the book, which have been adequately reproduced.

In fact, this small book can be compared to the better style of English nature books, which are of the best. The quality of the paper used is good and brings out the details of the half-tones excellently. It is one of our few books that can be recommended to any inquirer for a simple yet good small book on our Lepidoptera. While here and there is lapses from grace, its simple language will hold no terrors for the beginning young collector (for whom the work is obviously designed), who is ordinarily quite daunted by the simplified professorese with which so much of our popular work on nature is besprinkled.

I know a little Girl Scout who will love it. It answers so many of her quests and sets her on the right track of the replies to others.

In this day of high prices, it is reasonably priced for a good book and quite within reach of small purses. Get it for the youngsters. J. R. T.–B.

PROCEEDINGS OF THE SOCIETY.

Meeting of March 12, 1931.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, March 12, 1931, at 8.30 p. m.

President Davis in the chair, and 13 members present, viz., Messrs. Eisenhardt, Engelhardt, Glanz, L. Lacey, Lemmer, Lerch, Moennich, Schaeffer, Shoemaker, Siepmann, Torre-Bueno, Wilford, and Wurster, and three visitors, including Mr. Rummel, of Newark, N. J.

The minutes of the previous meeting were read and approved. Mr. Engelhardt reported for the treasurer.

Mr. Torre-Bueno reported for the publication committee, touching upon some of the difficulties encountered in preparing the indexes for two publications. He also stated that the last volume of the Bulletin mentioned between seven and eight hundred species, and in it were described seven new genera, seventy-eight new species and four additional forms. There were few new Long Island records in the 1930 volume of the Bulletin, compared to the large number recorded in the preceding volume.

Mr. Schaeffer said that this could be partly accounted for by the fact that a list of additions to the list of Long Island Coleoptera was in preparation.

A discussion followed as to whether it would not be better to issue the index of the Bulletin with the last issue of each volume, but it was decided best to conintue doing as heretofore, issuing the index with the first number of the succeeding volume.

Mr. Torre-Bueno exhibited a copy of a new book, "A History of Entomology," by Dr. Essig, published by The McMillan Company. This volume is of special value to those who are interested in the history of the entomology of our western states.

Mr. Engelhardt mentioned that with the coming of more professional men into the field of entomology, the meetings of most societies are becoming more or less formal, the Brooklyn Entomological Society being one of the few societies which still has informal meetings.

Mr. Davis appointed a field committee, to consist of Mr. Moennich, as chairman, and Mr. Shoemaker.

Mr. Schaeffer reported that he had an undescribed species of *Cyphon* (Dascyllidae) from Long Island.

Mr. Eisenhardt spoke on the Zygaenidae, a family of moths, known as "blood drops" in Europe on account of the bright red spots on the wings of many of the species. He exhibited specimens from both the United States and Europe.

The Zygaenidae are not very well represented in the fauna of North America. They are very common in the old world and are closely related to the Syntomidae. The habits of these insects are very much the same as their cousin in North America, *Harrisina americana.* Although while the latter feeds mostly on grapevine, the European ones feed on different varieties of clover and also on grapevine. The American insects have been so well described by Professor C. V. Riley that we cannot do better to quote some passages from his account, which is to be found in the "Second Annual Report of the State Entomologist of Missouri" on page 85.

He says, "During the months of July and August the leaves of the grapevine may often be found denuded of their softer parts, with nothing but the veins and sometimes only a few of the larger ribs left skeleton-like, to tell of the mischief that has been done. Very frequently only portions of the leaf will be thus denuded, and in that event, if we examine such a leaf closely, we shall find the authors of the mischief drawn up in a line upon the yet leafy tissue with their heads all toward the margin, cutting away with their little jaws and retreating as they feed. These soldier-like flies are formed by worms in black and yellow uniforms which produce a moth popularly known as the American Procris. The eggs from which they hatch are laid in small clusters on the under side of the leaves, and while the worms are small, they leave untouched the most delicate veins of the leaf, but when they become older and stronger they devour all but the larger ribs. When full grown these worms disperse over the vines or forsake them entirely, and each spins for itself a small tough whitish, flattened cocoon, within which, in about three days, it changes to a chrysalis, three tenths of an inch long, broad, flattened, and of a light shining yellowish-brown color. In about ten days afterwards the moths begin to issue." The insect is double brooded.

Mr. Lemmer exhibited some Geometers of the genus *Plagodis.* His collection contained twelve species and a subspecies—all of the forms described in that genus up to the time of the Barnes List, although an additional species had been described since then.

Mr. Lemmer did not breed many of the Geometers, but those that he had bred were bred from oak.

Mr. Wurster exhibited a large series of *Cecropia* and *Polyphemus* moths, showing a great range in coloration. He also showed some dwarfed specimens of the latter species, and the small cocoons from which they had emerged. The reason for the dwarf size, Mr. Wurster explained was due to undernourishment in the larval stage.

Mr. Engelhardt read an interesting and inspirational letter he had received from Mr. John D. Ritchie, of Saskatchewan, Canada. Mr. Ritchie wrote of how entomology had helped him along in life and of the many pleasant hours he had spent collecting insects. Even when everything else seemed dark, he was able to find enjoyment in his hobby and retain an interest in life because of it. Although entomology had not brought him wealth in a material sense of the word, he felt that his life had been fuller and more livable through its medium. Mr. Engelhardt then spoke of his acquaintance with Mr. Ritchie on his visit to Saskatchewan.

Mr. Rummel exhibited cases of beautifully mounted inflated lepidopterous larvae from New Jersey, comprising 210 species. Even the hairy and spinose species had not a hair or spine out of place and presented a very lifelike appearance, attesting the extreme care and skill with which the collection had been prepared. The larvae, after being inflated and dried, were attached to wires inserted within, which were wrapped around pellets of cork punched with a specially made punch. The wire being securely wrapped around the cork pellets, the entire mount was easily pinned. The inflated larvae were glued to the inner or anal end only, to facilitate removal from the wire in case that should be desired. A bit of cotton was put at the end of the wire, to prevent it from wearing through the head of the caterpillar. The pellet of cork also served to hold the species label. This label was held vertically in a slit cut in the cork, which position made it easier to read than a horizontal label, as is generally used. The food plant of the larvae was indicated on a smaller horizontal label.

Mr. Rummel gave further observations on his experiences in collecting and rearing larvae, and in inflating and mounting them. It sometimes took as long as two hours to inflate and mount a single specimen. It was best to mount the larvae the day they were collected, but on account of the time required to do this properly, it is sometimes necessary to preserve them for a few days. A solution of formaldehyde was found best for this purpose.

Everyone present felt that Mr. Rummel's collection of inflated caterpillars was both interesting and unusually well prepared.

The meeting adjourned at 10:15 p. m.

Carl Geo. Siepmann,
Secretary.

Meeting of April 16, 1931.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, April 16, 1931, at 8:15 p. m. Mr. Davis in the chair, and fifteen other members present, viz., Messrs. Ballou, Bowdoin, Burke, Cooper, Eisenhardt, Engelhardt, L. Lacey, Lemmer, Moennich, Schaeffer, Sheridan, Shoemaker, Siepmann, and Wurster, and four visitors, including Miss Dora Befeler and Messrs. Pollard and Stecher.

The minutes of the previous meeting were read and approved. Mr. Engelhardt submitted the report of the treasurer for February and March, which showed the financial condition of the society to be excellent, and with sufficient funds to meet the obligations of the current year. There was an income of $959.92 since January 1, disbursements of $396.55; with a balance of $1,916.96 as of the date of the meeting. Mr. Engelhardt also stated that there would be no report of the publication committee, since Mr. Torre-Bueno was ill, and could not attend the meeting.

Mr. Moennich reported for the field committee, proposing a trip for Saturday, May 2, through Alley Pond Park, Long Island, taking the Port Washington train, leaving Pennsylvania Station 1:27 p. m. to Douglaston.

Mr. Siepmann stated that he had received a letter from Herr Herbert Hopp, SO 36, Berlin, Germany, Reichenberger Str. 79/80, who was interested in obtaining American Cychrus, for which he was willing to give desirable European Coleoptera in exchange.

Mr. Engelhardt read a communication from the Butterfly Art Studios, Winnipeg, Manitoba, who sell specimens of Lepidoptera at what seem to be reasonable prices.

Mr. Schaeffer exhibited a specimen of a Central American moth, *Ceramidia butleri,* Mötshel, which was raised on Long Island from a pupa on banana, and was brought to him by some high school girls.

Mr. Davis spoke on the destruction of the elliptical goldenrod gall and its maker, *Gnorimoschema gallaesolidaginis,* Riley, by a rodent, in all probability a species of mouse, judging from the size of the teeth marks on the torn galls, and the size of animal thhat could climb a goldenrod stalk without breaking it. Since the actual work was done at night, he had not been able to see the rodent doing it. The mouse had climbed up the stalk and opened up the galls in order to get at the larvae inside. This was done in July 1929, which was before the galls were mature, so that some of the gnawed edges had grown over again. Although the moths forming the gall were as common in 1930 as in 1929, no galls were noted gnawed by the mice in 1930. Mr. Davis exhibited a large number of the galls destroyed by the rodent, of which 124 had been taken in all, and about as many more left standing. His paper will be published in the BULLETIN in full.

Mr. Davis also exhibited the work of mice gnawing the egg masses of the praying mantis, and the cocoons of Cecropia and Polyphemus moths, and the galls of wild rose and blackberry, which were torn open to secure the larvae inside. On Staten Island, N. J., he added, squirrels open up acorns to secure the Balaninus larvae. Specimens of the moth causing the gall, and of the parasites bred from the galls were also exhibited, as well as some of the round goldenrod galls, which are caused by a species of fly. Mr. Davis also showed a leaf rolled by *Anacampsis innocuella,* the poplar leaf roller, a moth allied to the elliptical goldenrod gall moth, which was rolled crosswise, instead of lengthwise, in the usual manner.

Mr. Wurster remarked that squirrels do not open dead cocoons and commented upon their keen sense which permits them to determine whether the cocoon is still tenanted by a pupa or not.

Mr. Engelhardt, in connection with Mr. Davis's paper, spoke of the work of Mr. Bird, who found that one of the minute parasites of the elliptical goldenrod gall moth divides in the egg stage, so that a great many individuals may arise from a single egg: a curious phenomenon unparallelled in the animal kingdom.

Mr. Shoemaker exhibited nine cases of Geometers, representing about 180 species, or three fourths of his entire collection of that family. His material was very excellently prepared, and included a specimen of *Nacophora quernaria* variety *atrascens,* a rare melanic form. An illustration of this variety has been published in *Entomological News,* December, 1922, page 319. Mr. Shoemaker's collection included six species of *Plagodis*—the genus of which Mr. Lemmer exhibited specimens at the March meeting.

Mr. Schaeffer spoke on the variation of *Lema trilineata* and other Coleoptera and exhibited specimens illustrating his talk. Looking over the list of European Coleoptera, he said, one finds a much larger number of varieties listed than is the case with the American Coleoptera. It would appear from this that the American Coleoptera are much less variable, but this is not the case, but is merely due to the fact that the American Coleoptera have not devoted much of their attention toward naming varieties. The European Coleoptera have been pretty well studied, and there is little left to describe except varieties, which are based, for the most part, upon color and markings.

In American entomology, Dr. Horn described few varieties, and his precedent has been followed by most coleopterists, which helps to explain American conservatism in this respect. It has been questioned whether it is worth while to name varieties at all, and there is a tendency to put an end to an indiscriminate production of them. Personally, Mr. Schaeffer said, he would not describe color varieties, except geographic races, which differ according to the locality in which they are found.

If the European system of nomenclature were followed, the forms of Lema allied to *trilineata* would be described as at least eight forms. Among the more common forms are the Atlantic coast form (typical *trilineata*) which has broad elytral fasciae, occupying the last three intervals or more, and of which few specimens have spots on the prothorax or the apex of the prothorax black. The southern Californian form, which is strictly Californian, has wide elytral vittae, dark markings on the head, and usually has dark legs, though it may vary a little in this respect. The western form, which corresponds to the *trivittata* of Say, has narrow elytral vittae, occupying the last two or only one elytral interval. The southeastern variety has the head with an interocular dark spot. No northeastern specimens have such a spot, no matter how dark the head is. Intermediates between this and the typical northwestern form occur in North Carolina and Alabama.

Mr. Schaeffer also exhibited some specimens of *Lema balteata,* exhibiting a wide range in coloration. The species is usually blue with a transverse yellow fascia across the elytra. Many specimens often have an additional sport or two at the apex, which are sometimes united to form a fascia. The thorax is sometimes entirely black, except the margins, or very rarely the entire prothorax is reddish. The form *equestris* Lac., described from Central America is merely a color form of *balteata*.

Mr. Eisenhardt said that Lepidopterists always had some fad or other, of which they were unusually anxious to secure specimens. At one time it was *Morpho;* and now it is *Agrius*. The genus *Agrius* is found in South America, about the Amazon River, and all of the species are of brilliant contrasting colors, usually red with black or blue. The demand for them is so great that a pair of many of the species brings as much as sixty dollars among the dealers. Mr. Eisenhardt exhibited a number of specimens of this genus, including six species.

The meeting adjourned at 10:15 p. m.

Carl Geo. Siepmann,
Secretary.

Alveotingis grossocerata.—Most of the records of this rare tingid are quite accidental. Little, if anything, seems to be known of its habits. So it is that on July 4, 1930, as I was walking along the glacial rocks that form the shore of Lake Buel, near Great Barrington, Massachusetts, I noticed a small, dark insect perched on a white rock; it looked like a bug, so I picked it up and bottled it. When I examined it under the lens, I was delighted to find that it was a long-winged specimen of this very insect. This is a new record for the state, and another record of the very rare macropterous form.—J. R. de la Torre-Bueno, White Plains, N. Y.

Vol. XXVI OCTOBER, 1931 No. 4

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, Editor

CARL GEO. SIEPMAN GEO. P. ENGELHARDT

Published for the Society by the

Science Press Printing Co.,
Lime and Green Sts., Lancaster, Pa.,

Price, 60 cents Subscription, $2.50 per year

Mailed December 8, 1931

Entered as second-class matter January 21, 1919, at the post office at Lancaster, Pa., under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

CONTENTS

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $2.50 per year; foreign, $2.75 in advance; single copies, 60 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXVI October, 1931 No. 4

NOTES ON NEW YORK THYSANOPTERA, WITH DESCRIPTIONS OF NEW GENERA AND SPECIES. III.*

By J. Douglas Hood, University of Rochester.

In this paper fourteen species, four of them new, are added to the known fauna of the State. The types of the new species are in the author's collection.

Sericothrips tiliæ sp. nov.

Female (*macropterous*).—Length about 1.1 mm. Color uniform yellowish white, without markings on body, wings, or legs; antennæ concolorous with body excepting for distal third of segment 4, pedicel and distal two-fifths of 5, and all of 6–8, which are dark gray; ocellar pigment bright orange.

Head fully 1.9 times as wide as median dorsal length in front of occipital line, broadest across eyes, slightly narrowed behind eyes, cheeks slightly rounded to extreme base which is narrowest; surface without noticeable sculpture; bristles as usual in the genus. Eyes fully three times as long as their distance from occipital line, about 0.63 as wide as their interval, pilose. Antennæ about 3.5 times as long as that part of head in front of occipital line, segments formed as usual in this group of the genus. Mouth cone about attaining posterior margin of prosternum, not slenderly prolonged at tip.

Prothorax about 1.65 times as long as head in front of occipital line and about 1.5 times as wide as long; pronotum with the usual raised anastomosing lines, which are closely

* The two previous papers in this series were published, respectively in the Bulletin of the Brooklyn Entomological Society, Vol. XX, No. 3, pp. 124–130, Pl. V (August 14, 1925); and in Entomologica Americana, Vol. VII (new series), No. 4, pp. 209–245, Pls. XX and XXI (June 14, 1927).

spaced; bristle at posterior angles yellowish and less than half as long as pronotum. Fore wings with all bristles brownish yellow; costal margin with about 28 bristles; longitudinal vein with 3 + 25, the distal one more widely separated than the others; two widely separated bristles in a second series at tip of wing.

Abdomen of normal form, without color markings; pubescence white and almost invisible, absent from median portion of basal tergites; bristles normal to this group of the genus.

Measurements of paratype (♀): Length 1.12 mm.; head, length in front of occipital line 0.080 mm., greatest width (across eyes) 0.155 mm., least width (at base) 0.128 mm.; eyes, length 0.060 mm.; width 0.043 mm., interval 0.068 mm.; prothorax, length of pronotum 0.132 mm., width across coxæ 0.192 mm.; pterothorax, width 0.248 mm.; bristles at posterior angle of pronotum, length 0.052 mm.; fore wings, length 0.780 mm., width at middle 0.037 mm., width near base 0.074 mm.; abdomen, greatest width 0.303 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	24	41	54	49	43	50	11	14
Width (μ)	28	27	20	19	18	17	7	6

Total length of antenna 0.286 mm.

Male (*macropterous*).—Slightly smaller than female (length about 0.9 mm.) and more slender, but essentially like it in color and structure.

Described from a large number of specimens taken on leaves of *Tilia americana* at Lakeville, N. Y., Aug. 14, 1930, J. D. H.,; Morton, N. Y., Sept. 1, 1930, J. D. H. and H. M. Hincher; and Bergen, N. Y., Sept. 2, 1930, J. D. H. and H. M. Hincher.

Type locality: Morton, N. Y.

Readily known by the pale coloration from all except *S. sambuci, S. spiritus,* and *S. albus.* The short mouth cone separates it readily from *albus,* while from the other two it may be known by the antennal coloration, the orange ocellar pigmentation, and the presence of two bristles behind the longitudinal vein of the fore wings near the tip.

Sericothrips sambuci Hood.

1924. *Sericothrips sambuci* Hood, Ent. News, **35**: 313 [5 ♀, Bladensburg, Md., Sep., leaves of *Sambucus canadensis*].

Additional material has come to hand, extending the known range of the species to include New York and Canada.

NEW YORK: Lakeville, July 9, 1930, J. D. H., on lower surface of leaf of *Sambucus*; 1 ♀.

MARYLAND: Plummers Island, Oct. 5, 1913, J. D. H., on leaf of *Sambucus*; 1 nymph.

CANADA: Vineland Station, Ontario, July 21, 1928, W. Putman, elder; 2 ♀.

Leucothrips piercei (Morgan).

1913. *Microthrips piercei* Morgan, Proc. U. S. Nat. Mus., Vol. 46, p. 19, figs. 27–30. [Texas and Tennessee, on cotton, *Vernonia,* and pawpaw, females only.]

1917. *Microthrips piercei* Hood, Ins. Insc. Menstr., Vol. 5, p. 60. [Virginia and Maryland, on leaves of *Polymnia* and *Silphium.*]

This tiny species, an addition to the known fauna of the State, was found by the writer at Lakeville, N. Y., August 14, 1930, on the leaves of a number of forest plants. Careful comparison has been made with one of Mr. Morgan's paratypes, taken at Dallas, Texas, on *Vernonia.*

The combination of generic and specific name given above is new. I have elsewhere[1] assigned *Microthrips* Morgan as a synonym of *Leucothrips* Reuter[2] and given my reasons for so doing.

Oxythrips ajugæ Uzel.

1895. *Oxythrips ajugæ* Uzel, Mon. d. Ordn. Thys., p. 136; Tab. V, fig. 67. [Bohemia, May and June, ordinarily in the flowers of *Ajuga,* singly on young pine needles.]

---

[1] Pan-Pac. Ent., Vol. VII, p. 170; 1931.

[2] To *Leucothrips* belong three described species: *L. nigripennis* Reuter (=*Microthrips leucus* Herrick), *L. piercei* (Morgan), and *L. theobromæ* (Priesner). The last was described as a variety of *piercei,* but the structural and colorational differences enumerated by Priesner seem to me to entitle it to specific rank. A fourth species—**Leucothrips furcatus** sp. nov.—agrees with *theobromæ* and *nigripennis* in having the trichomes on antennal segments 3 and 4 V-shaped instead of single. From *nigripennis* it may be known by the uniformly pale wings and from *theobromæ* by the absence of the crimson-red spot from the front of the head between the antennæ. It is represented by a series of eighteen females from Guadeloupe, French West Indies, March 12, 1915, C. B. Williams (his number 569), taken on the lower side of leaves of *Erythrina* sp. It is being more fully described and adequately figured elsewhere.

1908. *Oxythrips ajugæ* Bagnall, Ent. Mo. Mag., Vol. XIX, p. 5. [England, " very local and scarce " in the flowers of *Ajuga reptans.*]
1913. *Oxythrips ajugæ* Williams, Journ. Econ. Biol., Vol. VIII, p. 220. [England, abundant in pines in the spring, hibernating in pine stumps.]
1914. *Oxythrips ajugæ* Priesner, Wien. Ent. Zeit., Jahrg. XXXIII, p. 190. [Austria, in flowers.]
1916. *Oxythrips ajugæ* Hood, Ins. Insc. Menstr., Vol. IV, pp. 37, 38, 41. [Separated in key to known species.]
1920. *Oxythrips ajugæ* Priesner, Krancher's Ent. Jahrb., p. 171. [Germany, grasses.]
1920. *Oxythrips ajugæ* Priesner, Oberösterr. Musealver., Jahresb. 78, p. 54. [Austria, various plants.]
1925. *Oxythrips ajugæ* Priesner, Krancher's Ent. Jahrb., p. 158. [Hibernating in turf and in pine stumps.]
1926. *Oxythrips ajugæ* Priesner, Thys. Eur., p. 213. [Full account of the species.]

One female of this species was taken at Albany, N. Y., June 9, 1927, in the gutter along the roof of the State Museum, by Dr. E. P. Felt. It was dead when found. Careful comparison has been made with specimens from England and Austria, sent to me by Williams and Priesner, respectively, and no differences detected. The insect is an addition to both the New York and North American lists.

Thrips thalictri sp. nov. (Pl. VII, figs. 1–4.)

Female, forma macroptera.—Length about 1.3 mm. Color very dark blackish brown (black to the naked eye); all tarsi and ends of tibiæ (particularly the fore pair) nearly clear yellow, fore tibiæ paler at base than other tibiæ; antennæ dark blackish brown in segments 1 and 2, apex of 2 yellowish, 3 brownish yellow and usually shaded with gray basally, apically, and along sides, 3 and 5 each with a pale ring just beyond pedicel; fore wings gray at extreme base, remainder of basal fifth nearly white, distal four-fifths gray, darkest at tip and just beyond subbasal white band.

Head about 1.4 times as broad as median dorsal length measuring to edge of frontal costa), about 0.77 as long as pronotum, broadest near base, distinctly constricted and narrowest just behind eyes, the usual anastomosing lines on occiput dark and distinct; cheeks swollen, distinctly serrate; interocellar, postocellar, and postocular bristles subequal and moderately short (28–36 μ); ventral surface of head with the two anterior bristles about attaining apex of first antennal segment; all bristles dark brown. Eyes about 0.55 as long as head and only slightly narrower than their interval, decidedly protruding and prominent, pilose as usual, without differentiated (darker) facets. Ocelli normal, opposite middle of eyes. Antennæ slender, 2.7 times the median length of head, of normal structure; segment 3 slender, about three times as long as wide.[3]

Prothorax (in living individuals) about 1.5 times as broad across coxæ as median length of pronotum, the latter with very faint anastomosing lines of sculpture[4] at middle, more distinct near anterior and posterior margins; bristles at posterior angles equal (or the inner pair somewhat longer), brown, about 0.7 the length of pronotum; posterior margin with only two pairs of bristles between long ones at angles, the inner subequal to midlaterals and somewhat longer and stouter than interocellars and the other pronotal bristles. Wings of fore pair with about 25 bristles on costal margin, fore vein with 4 + 3 at base and 2 near apex (rarely with an additional one beyond middle), hind vein with about 12.

Abdomen of normal form; tergite 8 with comb either complete or narrowly interrupted at middle; tergite 10 divided to near base; *sternites 3–7 each with an irregular transverse row of about ten bristles across middle, these bristles only slightly shorter than the usual three pairs on posterior margin;* all abdominal bristles brown.

Measurements of holotype (♀): Length 1.31 mm.; head, median dorsal length 0.112 mm., greatest width 0.152 mm., width behind eyes 0.132 mm., width at base 0.147 mm.; eyes, length 0.059 mm., width 0.050 mm., interval 0.056 mm.; interocellar bristles, length 0.028 mm.; prothorax, median length of pronotum 0.140 mm., width across coxæ 0.210 mm., length of outer bristles at posterior angles 0.076 mm., of inner bristles at posterior angles 0.080 mm.; pterothorax, width 0.288 mm.; fore wings, length 0.915 mm., width at middle 0.062 mm., width just beyond scale 0.094 mm.; abdomen, greatest width 0.345 mm.; length of dorsal bristles on segment 9, 0.064 mm., of lateral bristles on posterior margin

[3] Very frequently the antennæ are 8-segmented, even on both sides of the same individual. This condition would cause such abnormal specimens to run in the published keys to *Tæniothrips* or *Physothrips,* and affords an instance of the difficulties sometimes encountered in maintaining generic separations.

[4] Usually visible only in KOH mounts.

of segment 9, 0.120 mm., of bristles on posterior margin of segment 10, 0.104 mm.

Antennal segments:	1	2	3	4	5	6	7
Length (μ)	30	42	64	56	45	54	24
Width (μ)	33	29	21	20	20	20	9

Total length of antenna 0.315 mm.

Female, forma brachyptera.—Apparently nearly identical with the macropterous form; wings pointed-oval, gray, dark brown in distal third, and about as long as the combined lengths of the first five antennal segments; antennæ about 2.6 times as long as head.

Male (*macropterous*).—Length about 1.1 mm. Color as in female. Head longer, about 1.16 times as wide as long. Abdominal sternites 3–7 each with a transversely elliptical pale area at middle, those on 3–5 about three times as broad as long, their breadth about equal to length of sternite, the areas on 6 and 7 somewhat more broadly elliptical; accessory bristles on sternites 3–7 limited to two pairs at sides.

Measurements of allotype (♂): Length 1.06 mm.; head, median dorsal length 0.114 mm., greatest width 0.132 mm., width behind eyes 0.117 mm.; width at base 0.124 mm.; eyes, length 0.058 mm., width 0.042 mm., interval 0.044 mm.; interocellar bristles, length 0.020 mm.; prothorax, median length of pronotum 0.111 mm., width across coxæ 0.184 mm., length of outer bristles at posterior angles 0.056 mm., of inner bristles at posterior angles 0.060 mm.; pterothorax, width 0.231 mm.; abdomen, greatest width 0.218 mm.

Antennal segments:	1	2	3	4	5	6	7
Length (μ)	24	38	54	46	42	54	21
Width (μ)	27	24	20	18	18	19	9

Total length of antenna 0.279 mm.

Described from 54 females (3 of them brachypterous) and 5 males, taken by the writer at Oswegatchie, N. Y., July 1 and 2, 1930, June 11, 1931, and July 11, 1931, on the leaves of *Thalictrum polygamum* Muhl. In company with its orange-yellow nymphs, it feeds in profusion on this common water-side plant before the leaves have attained their full growth. The feeding punctures of the insects give the leaves a white mottling which is quite noticeable and persistent throughout the life of the plant. Late in July neither nymphs nor adults could be found.

In a genus as large and difficult as *Thrips* it is gratifying to find a species as abundantly distinguished as this. I know of only one other species inhabiting North America in which are found accessory bristles on the intermediate abdominal sternites. From that species, *T. physapus* Linné, it may readily be distinguished by the much darker coloration of the antennæ, the much smaller, strongly protruding eyes, and the presence of two, instead of three, bristles in the distal half of the anterior vein. The white band at the base of the wings is conspicuous in living specimens.

Bagnalliella yuccæ (Hinds).

1902. *Cephalothrips yuccæ* Hinds, Proc. U. S. Nat. Mus., Vol. XXVI, p. 194; Pl. VIII, Figs. 83, 84. [♀♀, ♂♂, Amherst, Mass., and Washington, D. C., on *Yucca filamentosa* and goldenrod.]

(1908. *Cephalothrips yuccæ* Franklin, Proc. U. S. Nat. Mus., Vol. XXXIII, p. 727. [Barbados, West Indies, in flowers of *Hibiscus*.])[5]

1910. *Anthothrips yuccæ* Trybom, in Schultze, Zool. u. anthr. Ergebn. Forsch.-Reise westl. u. zentr. Sudafr., Bd. IV, Lief I, p. 173. [Merely referred from *Cephalothrips*.]

1913. *Cephalothrips yuccæ* Morgan, Proc. U. S. Nat. Mus., Vol. 46, p. 45. [Quincy, Fla., and Clarksville, Tenn., on *Yucca*.]

1917. *Cephalothrips yuccæ* Hood, Ins. Insc. Menstr., Vol. V, p. 64 [Maryland, in all seasons on *Yucca filamentosa*.]

1920. [*Bagnalliella*] *yuccæ* Karny, Acta Soc. Ent. Cech., roc. XVII, p. 41. [Designated as type of the new genus *Bagnalliella*.]

Throughout the year adults and nymphs live abundantly at the base of the leaves of *Yucca filamentosa*, and the distribution of the species is no doubt coincident with that of its food plant. In addition to the localities enumerated in the citations above, the species is known by me to occur in Illinois (Carbondale, Urbana, and Villa Ridge), Connecticut (Bridgeport), and New York (Rochester and Cold Spring Harbor, L. I.). It is not mentioned in the New York state list of insects.

Liothrips ocellatus Hood.

1908. *Liothrips ocellatus* Hood, Bul. Ill. State Lab. Nat. Hist., 8: 375. [Hillery, Illinois, hibernating in moss 1 ♀.]

1909. *P*[*hyllothrips*] (?) *ocellatus* Hood, Ent. News, 20: 31. [Referred from the genus *Liothrips*.]

[5] It seems very unlikely that this determination is correct.

1909. *Liothrips ocellatus* Hood, Ent. News, **20**: 249. [Referred from the genus *Phyllothrips.*]

1913. *Liothrips ocellatus,* Morgan, Proc. U. S. Nat. Mus., **46**: 46. [Vienna, Virginia, in galls on black walnut.]

This species is met with but seldom, five specimens only having come to my hand in the twenty-three years since its description. One of these is from Lakeville, New York, taken October 31, 1929, J. D. H., under bark of a living hickory tree. The species is an addition to the list of the insects of New York.

Rhynchothrips tridentatus (Shull).

1909. *Trichothrips. tridentatus* Shull, Ent. News, **20**: 226; fig. 6. [Huron Co., Mich., under scales of bark of white oak.]

1912. [*Rhynchothrips*] *tridentatus* Hood, Proc. Ent. Soc. Wash., **14**: 141. [Referred to the new genus *Rhynchothrips.*]

1914. *Rhynchothrips tridentatus* Hood, Proc. Biol. Soc. Wash., **27**: 159; Pl. 4, figs. 4, 5. [Illinois, Michigan, Missouri, Maryland, and District of Columbia added to known distribution.]

Since the publication of the last paper cited above, I have studied material which adds three states (one of them New York) to the known distribution of this species, and gives it a range from Texas to Michigan, Connecticut, and Maryland. This material is as follows:

NEW YORK: Lakeville, October 31, 1929, J. D. H., under bark of living hickory tree, 1 ♂.
Rochester, March 5, 1931, E. A. Maynard, bark of living hickory tree, 5 ♀, 5 ♂.

CONNECTICUT: Bridgeport, July 25, 1913, H. M. Russell, under hickory bark, 2 ♀.

TEXAS: Dallas, 1908, W. A. Hooker. [No further data.]

Rhynchothrips buffæ (Hood).

1908. *Trichothrips buffæ* Hood, Bull. Ill. State Lab. Nat. Hist., **8**: 369; Fig. 5. [Illinois, under bark of soft maple trees.]

1912. [*Rhynchothrips*] *buffæ* Hood, Proc. Ent. Soc. Wash., **14**: 141. [Referred to the new genus *Rhynchothrips.*]

In New York I have taken this species rather commonly at Oswegatchie. The larvæ were common August 1, 1930, on the trunks of maple trees, where their bright red color made them very conspicuous. Pupation takes place in protected situations, such as beneath loose scales of bark. Adults were secured between July 11 and August 10.

Trichothrips anomoceras Hood.

1912. *Trichothrips anomoceras* Hood, Can. Ent., Vol. XLIV, p. 137; Pl. VI, figs. 1–4. [15 ♀, 7 ♂, Plummers Island Md., under sycamore bark.]

1917. *Trichothrips anomoceras* Hood, Ins. Insc. Menstr., Vol. V, p. 61. [2 ♀, Vienna, Va., under grape bark.]

This species is added to the New York State list of insects on the authority of a fine series of 13 females, 18 males, and 7 nymphs taken under the bark of a fallen oak branch in a woods near Orient, Long Island, N. Y., April 4, 1913, by E. A. Maynard and the writer. As will be noted from the citations given above, it has heretofore been recorded only from Maryland and Virginia. Additional material before me is from Roslyn, Virginia, November 1, 1914, C. B. Williams and J. D. H., under willow bark; from Great Falls, Maryland, April 9, 1926, J. D. H., under bark; and from the type locality, where a long series was taken from dead sycamore bark in 1913, 1914, and 1915 by W. L. McAtee and myself.

Seen with the naked eye or under low magnification, it is of a decided orange color, and thus at a glance readily known from nearly all of the other North American species of its genus. Fully mature individuals are usually marked with dark gray in the last two antennal segments and at the sides of the tube, and have in addition a similarly colored pair of blotches on the disk of the pronotum and also at the sides of abdominal tergites 2 and 3. The pronotal blotches are often more or less coalesced, and are much more prominent in females than in males, the latter often lacking them entirely. Of the abdominal blotches, those on segment 2 are much the larger and frequently the only darkened areas present in the male.

Trichothrips flumenellus sp. nov. Pl. VII, figs. 5–7.)

Female, forma aptera.—Length about 2 mm. Color dull grayish yellow, darkened with brownish gray[6] on either side

[6] These markings are best observed under low magnification and by reflected light, as when the specimen is seen against a dark background.

of head at base, on whole of pronotum, on outer margins of fore coxæ, on pterothorax excepting for basal fourth, and on tergites of abdomen, these abdominal markings being darkest near sides of segments and nearly divided along median line; some or nearly all of the grayish blotches often wanting, that at the middle of pterothorax and the pair on abdominal tergite 2 more persistent and frequently darkest; tube lightly shaded with gray but not darkened at tip; antennæ and legs concolorous with lighter portions of body, unicolorous; subhypodermal pigmentation (when present[7]) disposed in numerous small patches throughout the body (excepting the tube and the appendages), this pigmentation nearly white by reflected light and, because of its opacity, black by transmitted light.

Head nearly 1.1 times as long as wide, decidedly broadest just behind eyes, tapering evenly to extreme base, which is about 0.84 the postocular width and just less than the greatest width across eyes; dorsum very weakly chitinized medially at base; dorsal and lateral surfaces without sculpture excepting for a few faint anastomosing lines on sides at base and with a number of minute pale bristles not arising from protuberances; postocular bristles pointed, about half as long as head (112 μ). Eyes greatly reduced, two facets only visible in lateral profile. Ocelli of posterior pair wanting, anterior one of variable size, sometimes nearly wanting, situated far forward between bases of antennæ on the slightly overhanging vertex, without accompanying pigmentation. Antennæ fully 2.25 times as long as head, quite stout, situated very close together, their interval 10–11 μ; segment 1 largest, broader than and fully as long as any other; 3–5 subtriangular, with sides nearly straight, 3 about 1.6 times as long as wide; 6 and 7 briefly pedicellate, sides rounded; 8 lanceolate, not broadly united to 7; sense cones short, only about one-third as long as width of segment; formula:[8] 3, 1–1; 4, 1–1;[9]

[7] The apparent absence of this pigmentation in some individuals may be due to the action of the preservative. Specimens mounted in Canada balsam a few days after capture all show the pigmentation, while nearly all specimens mounted some months later lack it.

[8] In the formula for the antennal sense cones, the number of the antennal segment is followed first by the number of sense cones on its inner surface and then by the number on its outer surface, rudimentary cones being expressed by an exponent preceded by a plus sign. Thus 5, $1\text{–}1^{+1}$ means that on the fifth an-

5, 1–1[+1]; 6, 1–1[+1]; 7 with one on *outer angle*. Mouth cone broadly rounded, nearly attaining posterior margin of prosternum in non-distended individuals, its length three-fourths that of head.

Prothorax rather large, lobed behind; pronotum smooth, along median line hardly 0.9 as long as head; prothorax across coxæ fully 1.6 times as wide as length of head; bristles pointed, those on anterior margin minute, those at posterior angles (136 μ) somewhat longer than postoculars, posterior marginals (84 μ) distinctly shorter, those at anterior angles (48 μ) usually less than half as long as postoculars, mid-laterals (44 μ) still shorter, coxals (92 μ) about equal in length to posterior marginals. Pterothorax distinctly narrower than prothorax across coxæ. Legs not stout; fore femora not swollen; fore tarsi on lower surface with a minute downwardly-directed tooth.

Abdomen slightly wider than prothorax across coxæ; bristles long, especially those of the lateral series and the dorsal pair on segment 9, these last attaining tip of tube, all bristles pointed and pale yellowish. Tube along ventral surface about 0.8 the length of head, about 2.2 times as long as subbasal width, and less than twice as wide at base as at apex, sides slightly concave basally.

Measurements of holotype (apterous), ♀: Length 1.95 mm.; head, length 0.225 mm., greatest width 0.210 mm., width across eyes 0.180 mm., width at base 0.176 mm.; interval between antennæ 0.011 mm.; eyes, length 0.030 mm., width 0.032 mm., interval 0.112 mm.; prothorax, median length of pronotum 0.192 mm., width across coxæ 0.369 mm.; pterothorax, width 0.336 mm.; abdomen, greatest width 0.390 mm.; tube, greatest (ventral) length 0.184 mm., width at base 0.082 mm., at apex 0.046 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	68	66	68	64	64	62	52	66
Width (μ)	48	38	42	45	42	37	32	23

Total length of antenna 0.510 mm.

Female, forma macroptera.—Length about 2 mm. Color brownish gray (brown to the naked eye), with a yellowish

tennal segment there is one fully developed sense cone on either side, with an additional rudimentary one on the outer surface.

[9] Rarely does this segment possess three of four sense cones. In 44 antennæ studied, two sense cones were found on the inner surface of segment 4 in four instances and two were found on the outer surface in 10 instances.

cast, darker in head and thorax; legs decidedly yellowish and paler at articulations and along inner surface of fore femora and tibiæ, tarsi yellow; antennæ with segment 1 dark and concolorous with head, 2 and 3 distinctly paler and more yellowish (especially basal portion of 3), 4–6 nearly as dark as 1 excepting in the more yellowish apical portion of each, 7 and 8 conspicuously and abruptly paler and nearly uniform yellow; tube yellow, darked with brown in *basal* fourth.

Head broadly rounded in front (because of the enlarged eyes), narrowest at base. Eyes about one-fourth the length of head, 1.2 times as long as wide, and about 0.55 as wide as their interval. Ocelli present, the interval between the posterior pair nearly twice their distance from anterior ocellus. Antennæ somewhat more widely separated than in apterous form, their interval about 13 μ; sense cones on distal segments as in apterous form, but those on 3 and 4 more numerous, 3 having (in 28 antennæ studied) an additional sense cone on the outer surface as frequently as not, and 4 with an additional sense cone on both outer and inner surfaces in all instances except 18%.

Pterothorax distinctly wider than prothorax, sides rounded, notum smooth. Wings clear or very faintly clouded, with scale gray and a yellowish cloud at base; two subbasal bristles only on fore wings, the distal one slightly shorter, the basal one subequal to bristle on anterior angle of pronotum; accessory hairs on posterior margins of fore wings 9 or 10.

Measurements of paratype (*macropterous*), ♀: Length 1.95 mm.; head, length 0.236 mm., greatest width 0.212 mm., width across eyes 0.197 mm., width at base 0.188 mm.; eyes, length 0.062 mm., width 0.052 mm., interval 0.094 mm.; ocelli, interval between posterior pair 0.043 mm., between anterior and posterior 0.024 mm.; interval between antennæ 0.013 mm.; postocular bristles, length 0.104 mm.; prothorax, median length of pronotum 0.180 mm., width across coxæ 0.351 mm.; prothoracic bristles, length of anterior marginals 0.020 mm., anterior laterals 0.056 mm., midlaterals 0.044 mm., posterior laterals 0.140 mm., posterior marginals 0.072 mm., coxal 0.088 mm.; pterothorax, width 0.375 mm.; abdomen, greatest width 0.447 mm.; tube, greatest (ventral) length 0.180 mm., width at base 0.080 mm., at apex 0.044 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	64	64	70	65	60	60	54	65
Width (μ)	56	38	43	44	42	38	32	24

Total length of antenna 0.502 mm.

Male (*apterous*).—Length about 1.8 mm. Smaller and more slender than female but otherwise similar excepting as noted: Antennæ about 2.3 times as long as head. Fore tarsi with a short and particularly stout tooth. Tube twice as long as its subbasal width.

Measurements of allotype (♂): Length 1.79 mm.; head, 0.188 mm., greatest width 0.172 mm., width across eyes 0.151 mm., width at base 0.148 mm.; eyes, length 0.024 mm., width 0.027 mm., interval 0.096 mm.; interval between antennæ 0.010 mm.; prothorax, median length of pronotum 0.164 mm., width across coxæ 0.315 mm.; prothoracic bristles, length of anterior marginals 0.020 mm., anterior laterals 0.044 m., midlaterals 0.052 mm., posterior laterals 0.100 mm., posterior marginals 0.072 mm., coxals 0.082 mm.; pterothorax, width 0.300 mm.; abdomen, greatest width 0.360 mm.; tube, greatest length 0.152 mm., width at base 0.078 mm., at apex 0.040 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	58	58	56	53	53	52	44	58
Width (μ)	48	35	37	39	37	35	32	24

Total length of antenna 0.432 mm.

Described from 44 specimens (22 of which are apterous females, 14 macropterous females, and 8 apterous males), all taken near Oswegatchie, N. Y., July 29, 1930, by the writer, under moist, rotting bark of a stump (probably spruce) in the floodplain of the Little River.

I earnestly hope that this delicately colored little species, taken at the very edge of the beautiful Adirondack trout stream after which I have named it, does not turn out to be the same as Moulton's *Hoplothips kincaidi,* described from the State of Washington. Moulton compares *kincaidi* with the European *pedicularius* and with the North American *pergandei,* saying merely that from the former "it may be distinguished by its uniformly lighter color and by the whiter color of the larvæ," and from the latter "by the sharply pointed body bristles." We have at least seven North American species that differ from *pedicularius* in the same way, and more than a dozen which are unlike *pergandei* in having pointed bristles (in fact, *angusticeps* and *pergandei* are the only species on the continent possessing such knobbed bristles!), yet no mention is made of the differences between *kincaidi* and its real relatives!

It would seem that *flumenellus* is a different species, however, because of the narrower space between the bases of the antennæ in the apterous form (10 or 11 μ in comparison with 15 μ in *kincaidi*), and because of the almost invariable presence of the median ocellus.

Hoplandrothrips virago sp. nov. (Pl. VIII, Figs. 1–7.)

Female (*macropterous*).—Length about 2.2 mm. Color of fully mature individuals dark blackish brown (black to the naked eye), tarsi and articulations of legs little if any paler, tip of tarsal tooth yellowish; sub-hypodermal pigmentation bright crimson red, nearly continuous throughout the body (particularly so in the abdomen), extending usually into the femora and always into the tube; teneral individuals bright red (particularly in abdomen), with head and thorax darkening first; antennæ concolorous with body (black to the naked eye or under low magnifications), except that segment 3 is yellowish (but not abruptly so) at extreme base and along middle of outer margin, and 4 is faintly yellowish at base. Wings clear, excepting for a slight basal cloud.

Head long, nearly 1.4 times its greatest width, broadest at middle, cheeks subparallel, rounded to eyes and more gently to near base, thence slightly diverging, forming a neck-line constriction which is distinctly narrower than the greatest width across eyes or slightly less than 0.9 the greatest width of head, set with three or four small, dark, pointed bristles; entire dorsal and lateral surfaces reticulate, less distinctly in occipital region, somewhat more finely and distinctly at inner posterior margins of eyes, and more strongly at sides of head so that the genæ are minutely serrate in profile; vertex distinctly produced and overhanging, more finely and distinctly reticulate than occiput; postocular bristles about 0.6 as long as eyes, dilated apically, situated near sides of head, their interval twice that of eyes. Eyes about 0.3 as long as head and about 0.7 as wide as their interval. Ocelli not equidistant, those of posterior pair about 0.7 as distant from anterior ocellus as from each other, their posterior margins about half the diameter of ocellus in advance of middle of eyes. Antennæ long, fully 1.8 times the length of head, slender; segment 3 clavate, about 2.7 times as long as greatest width, distinctly sinuate on inner surface, pedicel curved outward at base;[10] 4 about 2.6 times as long as wide; 5 nearly 2.9

[10] Formed almost exactly as in *H. gynandrus* Hood. The third antennal segment of *gynandrus* was figured in Ent. Amer., 7: Pl. XXI, fig. 2; 1927.

times as long as wide; 8 only slightly narrowed at base, hence rather closely articulated with 7; sense cones: 3, 1–2; 4, 2–2; 5, 1–1^{+1}; 6, 1–1^{+1}; 7 with the usual one on dorsum near apex. Mouth cone nearly attaining posterior margin of prosternum, labium broadly rounded and slightly surpassed by the acute labrum.

Prothorax about 2.7 times as broad across coxæ as median length of pronotum, which is hardly 0.5 that of head; pronotum nearly, if not quite, as deeply reticulate as head, more or less concentrically so around the shallow fovea (about as large as eye) at either side of middle; all usual bristles present, short, expanded apically, brown, the anterior marginals slenderer and shorter than postoculars, the others about comparable with the latter. Pterothorax slightly wider than prothorax, of the usual form; metanotum finely reticulate and faintly granulate,[11] the reticles at *extreme* base nearly equilateral, the others longitudinally elongate, particularly those at sides. Wings slenderer in distal half, fore pair with about 13 accessory hairs; subbasal bristles pale yellowish, about equal in length to postoculars, distal one pointed. Legs of fore pair rather stronger than usual, the fore femora enlarged and with either one or two large teeth on inner lower surface near apex, the fore tibiæ usually narrowed at base and generally with a distinct tooth beyond; fore tarsi with a stout, slightly-curved tooth.

Abdomen little broader than pterothorax. Tube somewhat more than 0.6 as long as head, about 2.5 times as long as greatest subbasal width (which is about twice the apical), sides nearly straight. Lateral abdominal bristles brown, rather shorter than usual, mostly knobbed; terminal bristles brown, nearly as long as tube.

Measurements of paratype (♀): Length 2.21 mm.; head, length 0.347 mm.; greatest width 0.251 mm., width across eyes 0.228 mm., width near base 0.215 mm.; eyes, length 0.104 mm., width 0.066 mm., interval 0.092 mm.; ocelli, interval between posterior pair 0.042 mm., between anterior and posterior 0.030 mm.; postocular bristles, length 0.064 mm.; prothorax, median length of pronotum 0.161 mm., width across coxæ 0.458 mm.; lengths of prothoracic bristles, anterior marginals 0.044 mm., anterior laterals 0.048 mm., midlaterals 0.048 mm., posterior laterals 0.056 mm., posterior marginals 0.060 mm.; pterothorax, width 0.480 mm.; ab-

[11] This granulation is clearly visible only in specimens which have been cleared in NaOH or some other caustic.

domen, greatest width 0.505 mm.; tube, length 0.215 mm., width at base 0.084 mm., width at apex 0.044 mm., terminal bristles 0.210 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	60	76	126	118	101	79	66	44
Width (μ)	48	42	47	45	35	31	29	19

Total length of antenna 0.670 mm.

Male (*macropterous*).—Length about 1.8 mm. Identical with female in color and very similar to it in structure, excepting for the smaller size, slenderer form, and various secondary sexual characters, such as: postocular bristles only slightly shorter than eyes; bristles at anterior angles of prothorax equal in length to eyes; anterior marginal bristles pointed.

Measurements of paratype (♂): Length 1.77 mm.; head, length 0.288 mm., greatest width 0.214 mm., width across eyes 0.196 mm., near base 0.177 mm.; eyes, length 0.084 mm., width 0.062 mm., interval 0.072 mm.; postocular bristles, length 0.080 mm.; prothorax, median length of pronotum 0.136 mm., width across coxæ 0.353 mm.; lengths of prothoracic bristles, anterior marginals 0.028 mm., anterior laterals 0.084 mm., midlaterals 0.044 mm., posterior laterals 0.048 mm., posterior marginals 0.050 mm.; pterothorax, width 0.363 mm.; abdomen, greatest width 0.318 mm.; tube, length 0.178 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	50	62	100	94	84	68	56	39
Width (μ)	42	35	40	40	34	28	25	17

Total length of antenna 0.553 mm.

Described from 377 specimens, of which 136 are males, as listed below:

NEW YORK: Oswegatchie, July 29, 1930, on trunks of young poplar trees (*Populus tremuloides*) felled in May, J. D. H., 30 ♀, 20 ♂; July 30, 51 ♀, 36 ♂; Aug. 1, 132 ♀, 69 ♂; Aug. 28, 22 ♀, 9 ♂; July 8, 1931, on trunks of dying poplars, 4 ♀, 1 ♂ (*holotype, allotype,* and *paratypes*).
Lakeville, Aug. 14, 1930, on trunk of dying poplar tree, J. D. H., 2 ♀, 1 ♂ (*paratypes*).

The only North American species with which this may profitably be compared is *H. gynandrus* Hood, likewise typically armed on the front pair of legs in the female sex with two femoral teeth and a single tibial one. The dark-colored antennæ of *virago* are distinctive, however, and apparently afford a thoroughly constant character. Slight structural differences between the two occur in various parts of the body. Thus the individual antennal segments are relatively more slender in *virago;* the eyes are smaller; the ocelli are slightly more anterior in position and scarcely equidistant; the pronotum is noticeably shorter and distinctly sculptured; and the metanotum is more finely reticulate, with the reticles elongate rather than predominantly equilateral.

As would be expected, a large amount of variation is shown in the femoral and tibial armature. Nearly all of the 377 individuals studied have two femoral teeth of large size, between which fits the single tibial tooth when the leg is flexed—an arrangement usually found in this genus only in the males. A reduction in the breadth of the fore femur, however, is always accompanied by a reduction in the size of the teeth or by the complete absence of the inner one. Such individuals commonly lack the tibial tooth as well. No specimens completely lacking all three teeth have been seen.

Hoplandrothrips funebris Hood.

1912. *Phlœothrips* (*Hoplandrothrips*) *funebris* Hood, Proc. Ent. Soc. Wash., **14**: 148; Pl. VII, figs. 1–4. [Illinois, Missouri, Maryland, District of Columbia, and Florida; branches of various species of trees.]

1915. [*Hoplandrothrips*] *funebris,* Hood, Ent., **1915**: 106. [Referred from *Phlœothrips.*]

1917. *Hoplandrothrips funebris,* Hood, Ins. Insc. Menstr., **5**: 63. [Virginia added to known distribution.]

One New York specimen, a female, was taken by the writer near Avon, N. Y., April 16, 1931, under the bark of a dry willow branch. It should prove not uncommon in the State, under loose bark of most species of trees.

Phlœobiothrips insolens (Hood).

1912. *Phlœothrips* (*Hoplandrothrips*) *insolens* Hood, Proc. Ent. Soc. Wash., **14**: 152; Pl. V, fig. 4; Pl. VIII, figs. 1–3. [1 ♀, Dubois, Illinois, on elm branch.]

1917. *Hoplandrothrips insolens,* Hood, Ins. Insc. Menstr., **5**: 63. [Plummers Island, Md., under sycamore bark and among dead leaves in fork of willow tree.]

1925. *Phlœobiothrips insolens,* Hood, Bull. Brook. Ent. Soc., 20: 129 (footnote). [Homer, Illinois, under willow bark.]

Two New York specimens, both females, are before me. One was taken at Coram, L. I., April 3, 1931, by the writer, under bark on a dead fallen limb of an unidentified tree; the other is from Rochester, April 8, 1931, and was taken by E. A. Maynard under dead willow bark. The species has not heretofore been taken in the State.

Explanation of Plates.

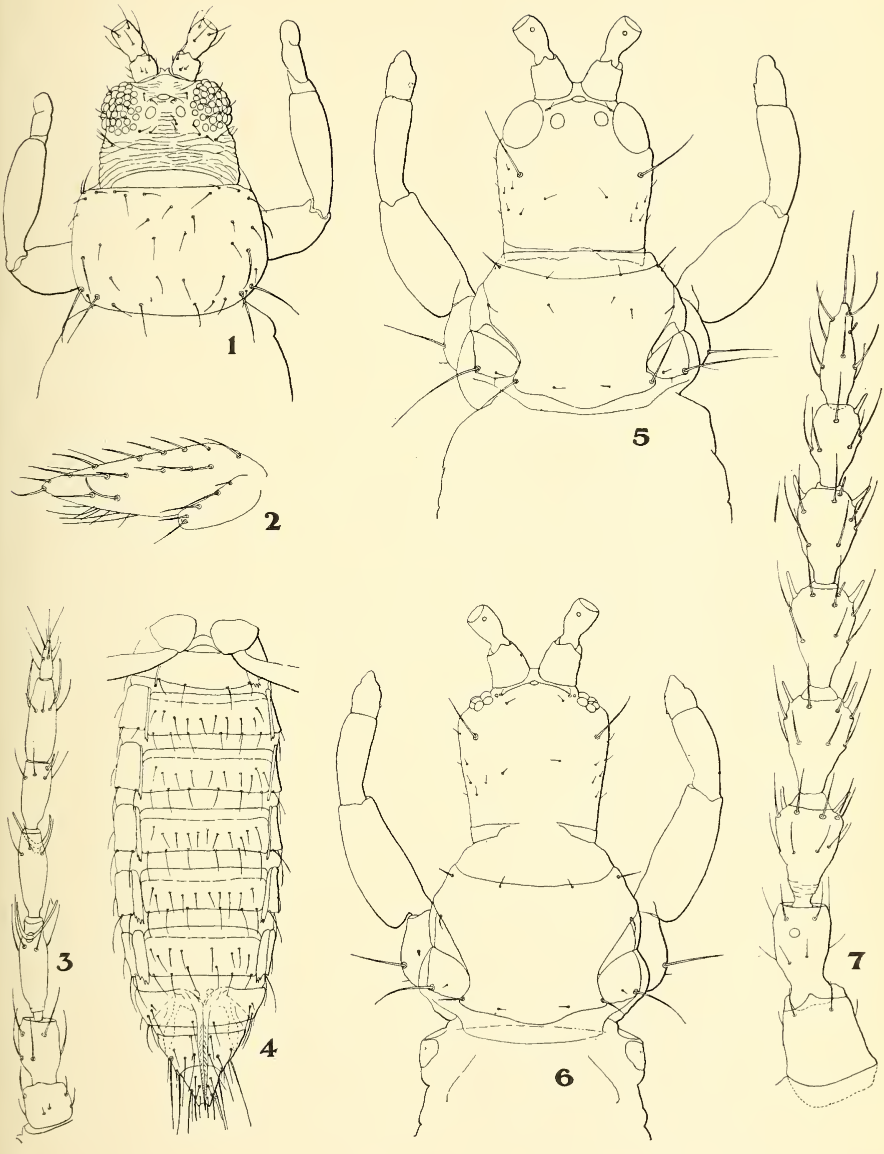
(J. D. H., camera lucida.)

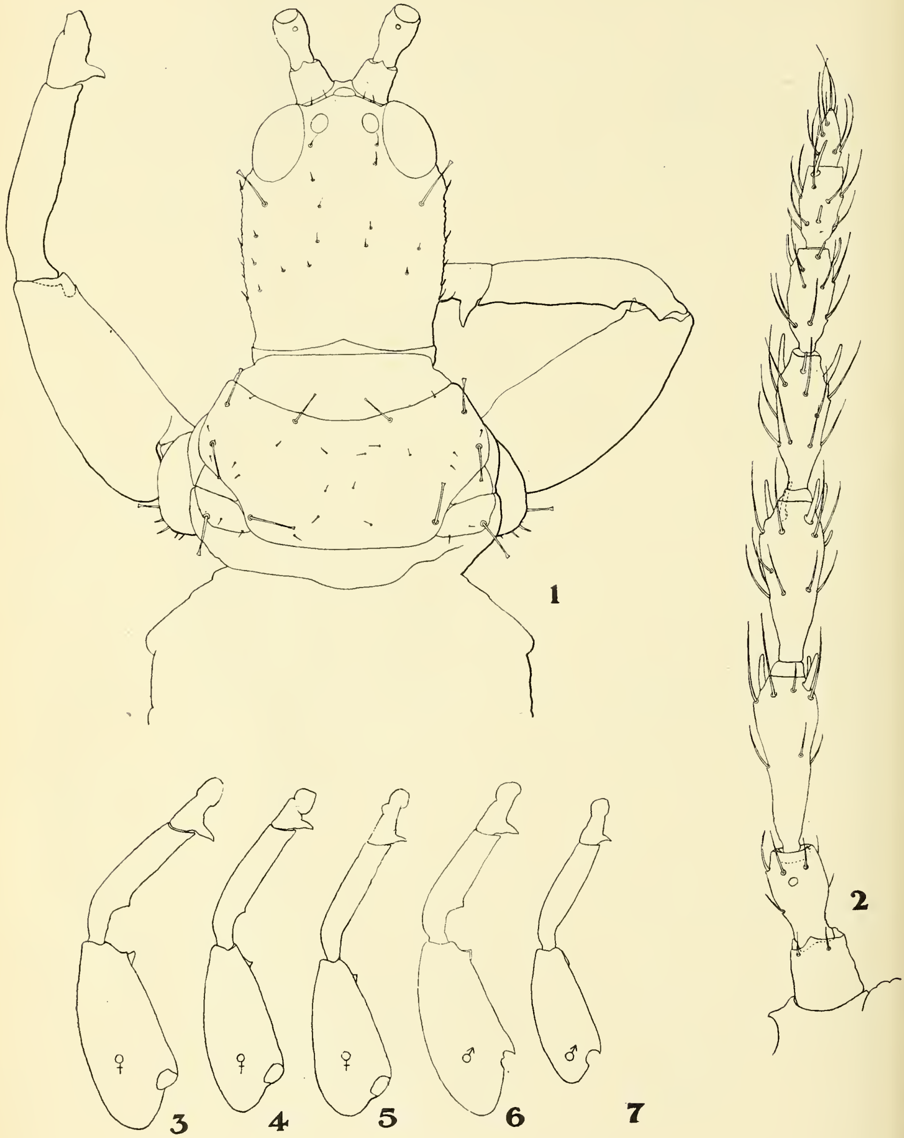
Plate VII.

Fig. 1.—*Thrips thalictri* Hood, ♀, paratype, head and prothorax. (All leg bristles omitted.)
Fig. 2.—*Thrips thalictri* Hood, ♀, paratype, left fore wing of brachypterous form.
Fig. 3.—*Thrips thalictri* Hood, ♀ holotype, right antenna.
Fig. 4.—*Thrips thalictri* Hood, ♀, paratype, ventral surface of posterior portion of body, showing chaetotaxy.
Fig. 5.—*Trichothrips flumenellus* Hood, ♀, paratype, head and prothorax of macropterous form. (All bristles omitted from appendages.)
Fig. 6.—*Trichothrips flumenellus* Hood, ♀, holotype, head and prothorax of apterous form. (All bristles omitted from appendages.)
Fig. 7.—*Trichothrips flumenellus* Hood, ♀, holotype, right antenna of apterous form.

Plate VIII.

Fig. 1.—*Hoplandrothrips virago* Hood, ♀, paratype, head and prothorax. (All bristles omitted from appendages.)
Fig. 2.—*Hoplandrothrips virago* Hood, ♀, paratype, right antenna.
Figs. 3–5.—*Hoplandrothrips virago* Hood, ♀♀, left fore leg, showing variations in armature.
Figs. 6–7.—*Hoplandrothrips virago* Hood, ♂♂, left fore leg, showing variations in armature.


1
2
3
4
5
6
7


1
2
♀
♀
♀
♂
♂
3
4
5
6
7

THREE NEW SPECIES OF CYRTORHINUS FROM NORTH AMERICA (HEMIPTERA, MIRIDAE).*

By Harry H. Knight, Ames, Iowa.

Cyrtorhinus balli n. sp.

Suggestive of *insperatus* Kngt., but femora without color stripes; distinguished by the shorter antennal segments and bi-colored aspect of the hemelytra.

♂. Length 2.7 mm., width .7 mm. Head: width .60 mm., vertex .32 mm.; black, shining, a pale spot each side of vertex bordering eye. Rostrum, length 1.05 mm., just attaining posterior margins of middle coxae, yellowish brown, apex fuscous. Antennae: segment I, length .28 mm.; II, .60 mm.; III, .78 mm.; IV, .52 mm.; uniformly black, a trace of pale at tip of second segment. Pronotum: length .26 mm., width at base .69 mm., sides and basal margin broadly sulcate in outline; pale to fuscous and blackish, anterior margin of disk orange yellow. Mesoscutum and scutellum dark fuscous, with orange tint in hypodermis. Dorsum clothed with very pale yellowish to dusky pubescence.

Hemelytra pale and fuscous, inner half of clavus bordering scutellum, apical half of corium, apical half of embolium except tip, and apical half of cuneus fuscous to blackish; membrane rather uniformly pale fuscous, a shade darker on areoles and veins. Ventral surface of body brownish to blackish, venter paler beneath, genital segment shining black. Legs pale to orange colored, apical half of hind femora becoming infuscated, tibiae and tarsi blackish.

♀. Length 2.6 mm., width .91 mm. Head: width .60 mm., vertex .34 mm. Antennae: segment I, length .30 mm.; II, .99 mm.; III, .78 mm.; IV, .47 mm. Pronotum: length .34 mm., width at base .70 mm. Very similar to the male in form and coloration.

Holotype: ♂, July 23, 1926, Jacksonville, Florida (E. D. Ball); author's collection. *Allotype:* same data as the type. *Paratypes:* ♂, 5♀, taken with the types. Texas—3♂, Sept. 28, 1929, Presidio (W. L. Awens). ♀, May 19, 1930, Hidalgo County (J. C. Gaines), taken at light, 2♂, Oct. 8, 1918, Anahuac (H. S. Barber); U. S. National Museum. Named in honor of Dr. E. D. Ball to whom the writer is indebted for this and several other new or rare species of Miridae.

---

* Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

Cyrtorhinus alboornatus n. sp.

Distinguished by the dark color with basal two-fifths of hemelytra pale whitish, cuneus likewise pale.

♂. Length 2.3 mm., width .8 mm. Head: Width .54 mm., vertex .30 mm.; vertex and frons broadly and evenly convex, the eyes protruding only very little above contour of frons and vertex; black, without pale spots on vertex. Rostrum, length .95 mm., barely attaining posterior margins of hind coxae. Antennae: segment I, length .346 mm., pale to dusky, darker at base; II, 1.03 mm., dark fuscous brown; III, .77 mm., black, IV, .70 mm., black. Pronotum: length .37 mm., width at base .73 mm., lateral margins of disk only very slightly sulcate.

Color dark brownish black, basal two-fifths of hemelytra and entire cuneus pale whitish; bases of femora and distal half of coxae pale to whitish; tibiae and tarsi pale fuscous, spines black. Membrane and veins rather uniformly pale fuscous. Clothed with very fine, short, pale to dusky pubescence.

♀. Length 2.5 mm., width 1.04 mm. Head: width .56 mm., vertex .33 mm. Antennae: segment I, length .30 mm.; II, broken. Pronotum: length .36 mm., width at base .82 mm.; lateral margins of disk distinctly sulcate. Slightly more robust than the male but very similar in coloration.

Holotype: ♂, July 23, 1926, Jacksonville, Florida (E. D. Ball); author's collection. Allotype: ♀, June 20, 1914, Dongan's Island, by Staten Island, New York (H. G. Barber); author's collection.

Cyrtorhinus pubescens n. sp.

Allied to *pygmaeus* Zett., but differs in the longer antennal segments and stronger black pubescence; with longitudinal fuscous stripe on pronotum and scutellum.

♀. Length 2.4 mm., width 1.25 mm. Head: width .70 mm., vertex .346 mm. Rostrum, length 1.08 mm., reaching to middle of hind coxae, pale to dusky, apex blackish. Antennae: segment I, length .34 mm., thickness .086 mm., uniformly pale fuscous, nearly blackish on basal constriction, with two prominent black bristles on dorsal aspect; II, .866 mm., thickness .044 mm., clothed with prominent black pubescent hairs, length of some hairs greater than thickness of segment, pale fuscous, darker on base and apex; III, .99 mm., blackish; IV, broken. Pronotum: length .41 mm., width at base .866 mm., basal margin broadly concave, lateral margins slightly sinuate, calli broadly and evenly convex, subconfluent.

Hemelytra abbreviated, translucent, membrane not extending beyond tip of cuneus; dorsum and elsewhere clothed with dusky to blackish pubescence. Color pale to dusky, pronotal disk and mesoscutum pale yellowish, with median longitudinal fuscous stripe which broadens on scutellum to involve apical half; head fuscous to blackish, pale bordering eyes; prothorax except disk, mesopleura and sides of venter distinctly blackish, venter beneath and the sternum pale. Legs pale, basal angles of coxae blackish, tarsi dusky; tibial spines and pubescence black.

Holotype: ♀, August 4, 1925, Wray, Colorado (H. H. Knight); author's collection.

ON A FEW NEW AND KNOWN COLEOPTERA.

By Chas. Schaeffer, Brooklyn Museum, Brooklyn, N. Y.

Cyphon cooperi n. sp.

Like *americanus* Pic in form, color, vestiture and punctuation but with the subbasal impression on each elytron transverse, not oblique as in *americanus,* and the large subapical impression also not oblique. The third antennal joint is slightly longer than the second and shorter than the fourth. The last ventral segment is arcuately emarginate at middle. Length 2.25 mm.

Southhold, Lg. Isld., July (Cooper); Cold Spring Harbor, Lg. Isld. (H. G. Barber); Staten Island (Weeks); McLean, N. Y., July (Cornell University). The type from Southold is in my collection, paratypes in my own and Cornell University collection.

Dermestes peruvianus Cast.
= *Dermestes angustatus* Casey.

Some of the stored Caribou skins in our Museum were badly infested by imagos and larvae of a species of Dermestes, which, on account of their unicolored vestiture of the underside, were first thought to be *nidum,* but mounting the specimens and comparing them with my specimens of the latter they prove to be different and on investigation were found to agree in every respect with Casey's fairly good description of *angustatus.* Later on, looking over the keys and descriptions of the European *Dermestes* I became fully convinced that *angustatus* is the same as *peruvianus.* Dr. Ganglbauer in "Die Käfer von Mitteleuropa" gives an excellent description of *peruvianus* with which my specimens fully agree.

In looking over my material I found that I had two specimens of this species placed below specimens of *nidum.* One was labelled "L. I." (Long Island), from the Pearsall collection and the other was collected by young Mr. Schiffer in Prospect Park some years ago.

A few specimens of *Gibbium psylloides* and *Nitidula ziczac* were also found on some of the skins.

Pallodes plateosus n. sp.

Flavo-testaceous, prothorax with black markings and elytra laterally and apically blackish. Head distinctly punctate, black, clypeus pale; antennae pale, club black. Prothorax with a large, blackish central spot and on each side of this a small, round black spot; surface finely, not densely punctulate. Elytra iridescent, especially laterally; surface pale, with a rather wide, lateral and apical black border; the serial punctures rather faintly impressed, intervals more or less visibly punctulate. Underside and legs pale; anterior and middle tibiae relatively narrower than in *silaceus*. Length: 4 mm.

Huachuca Mts., Arizona.

This species is less narrowed posteriorly than *silaceus*. The black median spot of prothorax is usually more or less distinctly divided longitudinally, but mostly very faintly, in one specimen this median spot is represented by two, narrow and short, dark, linear spots. The punctuation of prothorax and elytral intervals is variable, in some specimens very faint, in others more distinct.

Cucujus clavipes subnitens n. var.

Form of *clavipes* but first point of antennae, femora, tibiae and tarsi red; elytra feebly shining, scarcely opaque. Length: 12 mm.

Tucson, Arizona; Beaver Creek, Utah.

This form is less slender than the western var. *puniceus*.

Ischyrus quadripunctatus alabamae n. var.

Differs from the typical form in having the black basal markings of elytra confluent, forming a complete, apically strongly undulate basal fascia, median elytral fascia wider than usual; prothorax below and prosternum red except a small space around the anterior coxae and a narrow line at apex of prosternum black; first ventral segment of abdomen black, largely red at sides, second to fourth red, each at apex with an anteriorly strongly arcuate transverse black fascia not reaching sides nor base; last segment red. Length 7 mm.

Mobile, Alabama (Loding). Type in my collection, paratype in Mr. Loding's collection. The prothorax is rather less strongly narrowed to apex and the elytra are slightly more parallel than typical *quadripunctatus*.

Ptinus raptor Str.

From one of the cases of the school loan collection of the Children's Museum containing a very small nest and specimens of *Vespa maculata* I took six specimens, two males and four females, of a *Ptinus*, which, on investigation, proved to be the European *Ptinus raptor*.

This species belongs in the subgenus *Cyphoderes* distinguished from the other six or seven subgenera by having at middle the base of pronotum two rather large yellowish tomentose elevations which are absent in the species so far known to occur in the United States. The form, vestiture and markings of elytra of this species are nearly as in *fur.*

Serica brunnea L.

A small number of specimens of a *Serica* have been taken at light at Flushing, Long Island, which agree with the descriptions of the common European *Serica brunnea* L. It is the third European species taken by Mr. Kenneth Cooper at Flushing.

The upper surface is dull as in *sericea* and allies, but narrower in form, eyes large and more prominent, antennal club of the male very large and about twice as long as the preceding joints together, of the female normal; the pronotum has both the anterior and posterior angles rounded, the sides scarcely arcuate but nearly straight, and surface more or less iridescent. The color in fresh specimens is rather yellow, the head between and behind the eyes usually darker but moistened and old specimens are pale brown in color.

The form of prothorax with anterior angles also rounded, head with eyes large and prominent and the unusually large antennal club of the male separates this new addition from any of our North American species of *Serica.* The femora and tibiae are also narrower than in *Serica* and allies.

It seems to be well established as Mr. Cooper tells me that they were plentiful at the time he found them and could have taken more specimens.

Biting Bugs.—Hematophagous Heteroptera are well-known human pests; and there are here and there records of plant feeders and predaceous forms occasionally biting man, such as *Anthocoris musculus,* which has been recorded as quite a pest to the hop-pickers in New York.

The mirid bug *Hyaliodes vitripennis,* a predator on aphids, has been charged with this offense; and here is another instance of its aberration. On July 25, while beating trees for mirids, I felt a bite on my bare fore-arm, and there was a *Hyaliodes* standing, with its lancets in me. I let it bite, to see what effect it might produce. It felt like a light mosquito bite; and left no after-effects of any kind, except a very small lump. The statement has been made that it has done this when the skin was moist with summer perspiration, but in this case my arm was quite dry.—J. R. de la Torre-Bueno, White Plains, N. Y.

NEW OR INSUFFICIENTLY-KNOWN CRANE-FLIES FROM THE NEARCTIC REGION (TIPULIDAE, DIPTERA). PART III.

By Charles P. Alexander, Amherst, Mass.*

The preceding parts under this general title were published in 1930 (Bull. Brooklyn Ent. Soc., 25: 71–77; 276–282). The types of the species collected by Dr. G. C. Crampton and the writer are preserved in my collection. The type of *Limonia subapicata* has been returned to Dr. J. Speed Rogers. The very interesting series of Tipulidae collected by Mr. Owen Bryant in British Columbia and Alberta has been returned to Mr. Bryant. My sincere thanks are extended to the above-mentioned entomologists for their continued co-operation in making known the crane-fly fauna of the Nearctic region.

Dolichopeza (Oropeza) tridenticulata n. sp.

Male.—Length about 10 mm.; wing 11 mm.

Described from alcoholic specimens.

Closely related to *obscura,* differing especially in the structure of the male hypopygium. Antennae dark brown. Mesonotum dark reddish brown, the pleura still darker. Legs with the tarsi a little paler than the tibiae. Wings suffused with brown, the oval stigma slightly darker brown; paler areas before and beyond the stigma and across the base of cell 1st M_2. Abdominal segments brownish yellow, conspicuously ringed with dark brown on the incisures, on the sternites the bases of the segments more broadly darkened than the apices. Male hypopygium with the central portion of the tergal margin produced into a small rectangular area that bears three small chitinized points; lateral arms of tergite evenly rounded at tips. Inner dististyle very broad, weakly bidentate at tip, one of the points being a small blackened spine. Outer dististyle and gonapophyses much as in *obscura.*

Habitat: Massachusetts.

Holotype: alcoholic ♂, Goshen, Hampshire Co., July 1, 1931 (*G. C. Crampton*).

Dolichopeza (*Oropeza*) *tridenticulata* is most closely allied to *D.* (*O.*) *obscura* (Johnson), differing very conspicuously in the details of structure of the male hypopygium, notably the median

* Contribution from the Entomological Laboratory, Massachusetts State College.

toothing and obtuse lateral arms of the tergite, and the very broad inner dististyle. Besides the type, a few additional females were taken. Dr. Crampton reports the species as being very common in a darkened shed.

Limonia (Limonia) subapicata n. sp.

Belongs to the *apicata* group; mesonotal praescutum polished yellow, with a broad black median stripe; lateral margins of praescutum blackened; wings grayish subhyaline, the stigma long-oval, pale brown.

Male.—Length about 5–5.5 mm.; wing 5.2–6 mm.

Antennae black throughout; flagellar segments oval, with verticils that slightly exceed the segments. Head black, very sparsely pruinose.

Pronotum dark medially, paler laterally. Mesonotum polished yellow, with a conspicuous median black stripe that is widened at the suture; lateral margins of praescutum behind the pseudosutural foveae conspicuously blackened; scutal lobes blackened; median region of scutum and the scutellum more brownish testaceous; postnotal mediotergite dark brown. Pleura testaceous brown, darkest on the anepisternum, and, in some cases, the ventral sternopleurite; in other cases, the latter region is distinctly yellow. Halteres pale, the knobs weakly darkened. Legs with the coxae and trochanters yellow; femora black, the bases yellowish; remainder of legs black. Wings grayish subhyaline; stigma long-oval, pale brown; no darkening in outer radial field; veins dark brown. Venation: Sc_1 ending about opposite three-fourths the length of Rs, Sc_2 close to its tip; Rs weakly angulated at origin; free tip of Sc_2 and R_2 in nearly transverse alignment; $m–cu$ at or close to fork of M.

Abdominal tergites brown; basal sternites yellow, the outer segments dark brown; lateral line narrowly dark brown; hypopygium brownish yellow. Male hypopygium very much as in *apicata,* differing only in details. Lobules at proximal end of basistyle very similar in both species; subapical lobes on same face having setae and spines much less developed, the elongate paired spinous setae of *apicata* here being a single, small, gently curved spine. Outer margin of dististyle with the crest of blackened spines low and depressed.

Habitat: Florida.

Holotype: ♂, Gainesville, Alachua Co., May 10, 1930 (*J. S. Rogers*); Collector's No. 644. *Paratypes:* several ♂♂.

The closest ally in the *apicata* group is *L.* (*L.*) *apicata* (Alexander) which differs in the pattern of the mesonotum, the strongly infumed wing-tips, and the details of structure of the male hypopygium. The fly is entirely different from the only other regional member of the group, *L.* (*L.*) *rogersiana* Alexander.

Tricyphona rubiginosa n. sp.

General coloration reddish brown, sparsely pruinose; antennae black throughout, 16-segmented; wings with a deep fulvous tinge; venation of radial field very variable, cell R_3 being short-petiolate to broadly sessile; cell M_1 present; cell M_2 open by atrophy of *m*; male hypopygium with two dististyles.

Male.—Length 6–7.5 mm.; wing 6.5–7.5 mm.

Female.—Length 7.5 mm.; wing about 7 mm.

Rostrum and palpi black. Antennae black throughout, 16-segmented, the segments short-oval, with short verticils. Head brownish gray.

Mesonotum reddish brown, sparsely pruinose, the praescutum with a slightly darker median brown stripe; a deep pit on parascutella on either side of scutellum. Pleura reddish brown, overcast by gray. Halteres pale yellow, the large knobs weakly infuscated. Legs with the coxae reddish gray; trochanters yellow; remainder of legs brown, the terminal segments passing into dark brown. Wings relatively narrow, with a deep fulvous suffusion, iridescent, the stigmal region more suffused; veins deep yellow. Venation: Sc_1 ending shortly beyond the level of cord, Sc_2 a distance before origin of *Rs* greater than the length of the latter vein; forking of *Rs* variable, in some cases with a short R_{2+3+4} that is a little shorter than the basal section of *Rs,* in other cases, even on the two wings of a single specimen, cell R_3 narrowly to broadly sessile by the obliteration of R_{2+3+4}; cell M_1 present; cell M_2 open by the atrophy of *m*; *m-cu* oblique, more than one-half its length beyond the fork of *M*.

Abdominal tergites brownish gray, the sternites more brownish yellow, the caudal margins of the segments infuscated, on the subterminal segments including the entire sclerite; hypopygium obscure yellow. Male hypopygium relatively large, the tergite broad, its caudal lobe transverse to very feebly emarginate; lateral arms of tergite pale, at ends irregularly bifid, the principal arm a powerful curved point. Basistyle at apex produced laterad into a slender lobe. Dististyles two, a longer foot-shaped lobe, in addition to the usual oval lobe set with abundant short spinous setae.

Habitat: British Columbia, Alberta.

Holotype: ♂, Laggan, Alberta, July 16, 1928 (*Owen Bryant*); Collector's No. B–28–5. *Allotype:* ♀, Ptarmigan Pass, Laggan, Alberta, altitude 6000–7000 feet, July 23, 1928 (*Owen Bryant*). *Paratopotypes:* 2 ♂♂, with the type; *paratype:* 1 ♂, Hector, British Columbia, on dry red rock, July 15, 1928 (*Owen Bryant*); Collector's No. B–28–1.

Tricyphona rubiginosa is very different from all described species of the genus. The venation of the radial field is unusually plastic, and, if this were needed, furnishes additional evidence that the interpretation of this field as given by the writer in recent papers is the correct one.

The very excellent field notes taken by Mr. Bryant are given herewith. These observations pertain likewise to *Ornithodes harrimani* Coquillet and *Phyllolabis bryantiana* n. sp.

"B–28–1. Hector, B. C., July 15, 1928. On face of rock-cut beside road between Wapta Camp (and Lake) and high bridge over outlet to lake. Mostly in hollows in rock and where rock was actually wet. Many actually in behind falling water so that one had to reach a tube in through the water to get them. Speckled-winged ones mostly on dry moss or on dry rock. This species (*Limonia sciophila*) and the reddish ones with coppery wings (*Tricyphona rubiginosa* n. sp. and *Phyllolabis bryantiana* n. sp.) occurred more commonly on rock across the bridge, with springs trickling down over it. The three large spotted ones (*Ornithodes harrimani* Coq.) were on this rock where this was overhung several inches by moss with water dripping from it. A few about pier-head of bridge. The reddish ones occurred on this rock where this was dry and showed an especial fondness for rock with a good deal of red color in it, which made them very hard to see. All those on wet rock, with the three *Ornithodes* mentioned, were quite easily caught by putting the tube over them. The red ones on dry rocks were more scary. About 4 P. M. mostly in shade and some in quite dark recesses, the reddish ones more in the light. Some on vegetation about pier-head, perhaps after being disturbed." Other Tipulidae under this number included *Limonia* (*Dicranomyia*) *morioides* (O.S.), *Elliptera astigmatica* Alex., *Tricyphona aperta* Coq., *Dicranota* (*Rhaphidolabis*) *subsessilis* (Alex.), *Molophilus colonus* Bergr., and *Rhabdomastix* (*Sacandaga*) *subcaudata* Alex.

"B–28–5. Laggan, Alberta, July 16, 1928. Tipulids, etc., on face of rock and in large holes in rock face. Cliff at southwest end of Lake Louise, altitude 5700 feet. Part of these taken 100 feet above lake at top of slide where water is flowing down and a large cavern is made by a large slice of rock which has separated from the main body and leans against it. Others less than 10 feet above lake. Rocks quartzite, red, purple and various colors, stained in places with iron (and copper?). *Ornithodes* seem to be fond of getting into dark places, all being found in big holes, in comparative darkness, 4–6 P. M., dull day, sun behind mountain." Besides the records for *Ornithodes harrimani* and *Tricyphona rubiginosa,* Mr. Bryant had included under this number *Limonia* (*Limonia*) *sciophila* (O. S.), and *Elliptera astigmatica* Alex.

Dactylolabis hudsonica n. sp.

General coloration brown, the praescutal stripes very ill-defined and inconspicuous against the ground-color; femora light brown, the tips paling to yellowish; wings with a heavy grayish brown pattern, arranged as in the *montana* group; no supernumerary crossvein in cell R ; *m-cu* beyond the fork of M, in most cases the distance more than one-half the crossvein itself; male hypopygium with the basistyles dark brown.

Male.—Length about 6.5 mm.; wing 8–8.5 mm.

Female.—Length about 6.5–7 mm.; wing 7.5–8 mm.

Head dark, covered with a yellowish gray pollinosity.

Mesonotal praescutum brown, sparsely pollinose, the brown stripes ill-defined, especially the lateral pair; intermediate stripes becoming divergent to nearly obsolete on cephalic portion. Pleura more pruinose. Legs with the femora light brown, the tips paling to yellowish; tibiae and tarsi brown. Wings with a heavy brownish gray pattern, the areas arranged as in the *montana* group. Costal fringe and vestiture of veins consisting of delicate setae. Venation: No supernumerary crossvein in cell R_3; *m-cu* beyond the fork of M, in most specimens the distance more than one-half the length of the crossvein.

Abdomen dark brown, the caudal margins of the sternites pale. Male hypopygium with the basistyles dark brown.

Habitat: Quebec (Gaspé).

Holotype: Percé, June 28, 1931 (*C. P. Alexander*). *Allotopotype:* ♀, June 30, 1931. *Paratopotypes:* 4 ♂♀, June 28–30, 1931.

The specimens were not especially lithophilous, as is the case in other members of the *montana* group. Most of the individuals were swept from rank herbage growing in the partly dry bed of a mountain stream.

Phyllolabis bryantiana n. sp.

General coloration reddish; antennae black; wings with a strong brownish yellow suffusion, the oval stigma a trifle darker; male hypopygium with the appendage of the ninth sternite very broad, flattened, profoundly bifid; inner dististyle a simple clavate rod; gonapophyses very elongate, stylet-like; cerci of ovipositor slender, with entire margins.

Male.—Length about 6 mm.; wing 7.5–8 mm.

Female.—Length about 7.5 mm.; wing 8 mm.

Rostrum and palpi black. Antennae dark brown to black throughout; flagellar segments oval, gradually decreasing in size outwardly. Head dark gray; anterior vertex relatively narrow.

Pronotum testaceous brown. Mesonotum brown, the praescutum darker brown medially in front; no tuberculate pits; pseudosutural foveae pale; scutellum more yellowish. Pleura chiefly reddish yellow. Halteres pale, the knobs dusky. Legs with the coxae and trochanters yellow; femora yellow, passing into brown at tips; tibiae and tarsi passing through brown to darker brown. Wings with a strong brownish yellow suffusion, the oval stigma a trifle darker; veins yellowish brown. Venation: Sc_1 ending about opposite one-third the length of R_{2+3+4}, Sc_2 near its tip; Rs shorter than R_{2+3+4}; *m-cu* at or before the fork of M_{3+4}.

Abdominal tergites dark brown; hypopygium black, the styli and appendage of ninth sternite yellow; sternites testaceous yellow. Male hypopygium with the outer apical angle of basistyle produced into a stout lobe that is about as long as the outer dististyle. Outer dististyle a bilobed structure, the outer lobe expanded and truncate at apex. Inner dististyle a simple pale clavate rod, with abundant erect setae over the entire surface except the inner or cephalic margin. Appendage of ninth sternite very broad, flattened, profoundly bifid. Stylet-like spines of the gonapophyses very long and slender, exceeding in length and slenderness all other species in this faunal region. Ovipositor with the tergal valves (cerci) relatively long and slender, nearly straight, the ventral margin untoothed.

Habitat: British Columbia.

Holotype: Hector, on dry red rock, July 15, 1928 (*Owen Bryant*); Collector's No. B–28–1. *Allotopotype:* ♀. *Paratopotypes:* 9 ♂♀.

Phyllolabis bryantiana is named in honor of the collector, Mr. Owen Bryant. The fly is very different from all other described species in the Nearctic Region. The conditions under which the fly was taken are discussed under *Tricyphona rubiginosa* n. sp.

Phyllolabis lagganensis n. sp.

General coloration dark brown; wings tinged with gray; costal region of male dilated before stigma; R_{2+3+4} short, not exceeding one-half of R_3 alone; male hypopygium with the appendage of the ninth sternite very large, prow-shaped; basistyles complicated by an unusual development of apical and mesal lobes; inner dististyle much larger than the outer; gonapophyses long and slender.

Male.—Length about 6 mm.; wing 6.8-7 mm.

Rostrum and palpi black. Antennae of moderate length, if bent backward not attaining the wing-root, brown throughout; flagellar segments oval to long-oval, with numerous verticils that slightly exceed the segments. Head gray.

Mesonotum dark brown, with a sparse gray pruinosity, the pleura paler, especially the dorsal portions and the pteropleurite. Halteres yellow, the knobs infuscated. Legs with the coxae and trochanters yellow; remainder of legs light brown, the terminal tarsal segments darkened. Wings tinged with gray, the oval stigma slightly darker; veins brown. Costal region just before stigma strongly dilated, this presumably a special character of the male sex. Venation: Sc_1 ending about opposite midlength of R_{2+3+4} unusually short, about one-half R_3 alone; inner end of the relatively short and wide cell *1st* M_2 arcuated.

Basal abdominal tergites blackened, the intermediate tergites brown, the subterminal segments with a conspicuous black subterminal ring. Male hypopygium large and unusually complicated in structure. Appendage of ninth sternite very large, in dried specimens forming a prow-shaped structure, on slides appearing as flattened blades, each with a lateral lobule as base. Basistyle produced into lobes, the most conspicuous being three on apical and lateral portions, and three others on mesal face. Outer dististyle relatively small, beak-like. Inner dististyle a very large flattened blade, the apex long-produced. Gonapophyses very long and slender, much as in *bryantiana* but slightly shorter and more slender.

Habitat: Alberta.

Holotype: ♂, Laggan, July 16, 1928 (*Owen Bryant*). *Paratopotype:* ♂.

Phyllolabis lagganensis is very different from the other known species of the genus (eight recent, one fossil in Baltic Amber), all of which are available to me for comparison. The characters of the male hypopygium in the present species are unusually complex and difficult of description. The shortness of R_{2+3+4} distinguishes this species from all other described Nearctic species, but is approached by *macrura* (Siebke) of northern Europe and by two Himalayan species described by the writer. Whether the curious dilation of the costal region is a sexual character only remains to be discovered. The genus *Phyllolabis* is new to the Canadian fauna.

Argynnis diana Cr. **as observed about Hope, Arkansas.**—On June 1st, 1920, I noted a great swarm, seemingly hundreds of *A. diana* ♂ hovering over purple cone flowers which grew under trees within a sharp bend of a small stream. Amidst this thrilling sight I caught one glimpse of blue.

On May 16, 1921, I again observed a few males fluttering over the same mass of cone flowers and captured part of them, sending one or two specimens to Dr. Henry Skinner, who stated that "This date of capture is the earliest on record." Though I've visited this spot and sought these creatures elsewhere in other years I have, at most, seen but one or two specimens each year, some years none. However in November, 1925, I observed a much worn ♀ visiting my *zinnias,* some ten miles away from the above mentioned site. She was very gentle, permitting me to handle her with my fingers several times; in fact she returned daily for three or four days until frost killed the attractions—*i.e. zinnias,* which I find to be one, if not the best, of the flowers in this section for attracting day fliers. I presume just as good for night fliers, however I use masses of petunias for the Sphingiidae. I am wondering if *A. diana* Cr. is double brooded in this section.—Louise Knobel, Hope, Arkansas.

A NEW ONCEROTRACHELUS FROM CUBA (HEMIPTERA; REDUVIIDAE).

By H. G. Barber, U. S. Bureau of Entomology, Washington, D. C.

Oncerotrachelus magnitylus n. sp.

Pale luteous; surface of the hemielytra, except for narrow costal margin, embrowned; median nervure darker; unicolorous beneath. Head, pronotum, scutellum, and hemielytra with numerous long decurved hairs.

Head longer than pronotum, nearly one-third longer than wide, more extended anteriorly before the antenniferous tubercles than in any other known species of the genus; anterior region to the transverse postocular stricture twice as long as basal part to collum; eyes small, large faceted, and pilose, with the interocular space nearly three times as wide as the diameter of an eye. Eye in lateral view not nearly occupying the entire dorso-ventral height of head; vertex rather strongly convexly elevated; constricted just behind eyes (dorsal view), thence evenly and symmetrically rounded to collum. Rostrum devoid of the usual short erect setae or bristles on the upper surface. Antennae relatively short; basal segment about as long as length of head to collum; second segment one-third shorter; third and fourth together about as long as basal; first two segments sparsely covered with long, soft, nearly erect hairs plainly longer than diameter of the segments. Pronotum about one-third wider than long with the anterior lobe a little shorter than the posterior one; anterior margin depressed and strongly concave in the middle; median longitudinal sulcus evanescent just before the posterior margin, expanded anteriorly on the posterior lobe and obsoletely strigulate behind; humeral region strongly nodose, mutic; posterior margin either side the base of scutellum strongly impressed. Scutellum with central disk strongly depressed, devoid of a median longitudinal keel; slender apical spine not elevated, somewhat decurved towards apex. Hemielytra covering the connexival margins of the abdomen. Membrane fuliginous, not quite reaching apex of abdomen. Mesostermun unkeeled. Spine at the outer apical angle of the metapleura not well developed. Anterior coxae short, about twice as long as wide, not angulated below towards apex. Hind tibia densely pilose and provided with long semi-erect hairs much longer than tibial diameter. The first five ventral segments provided with a slight median longitudinal keel; posterior lateral angles of the connexival segments very weakly spinose produced. Length ♀ 4.5 mm.

Type.—Cat. No. 43583, U.S.N.M.; ♀ Mina Carlota, Trinidad Mts., Cuba (collected by J. C. Myers); 2 Paratypes ♀; same data (Museum Comparative Zoology).

Very distinct from *O. conformis* Uhler, the other West Indian species, because of the unarmed humeral angles. The anteriorly prolonged head, small eyes, short unangulated anterior coxae, and the short antennae will serve to distinguish this species.

Key to Species of Oncerotrachelus.

1. Humeral angles armed with a spine; median longitudinal sulcus of posterior lobe of pronotum anteriorly expanded and transversely strigulate; scutellum lacking a median carina .... *conformis* Uhl.

   Humeral angles unarmed.................................2

2. Eyes small, only one-third as wide as vertex; median longitudinal sulcus of posterior lobe of pronotum anteriorly expanded, obsoletely strigulate behind; rostrum almost devoid of erect setae next the head; scutellum devoid of median carina; anterior coxae short, not angulated below. **magnitylus** n. sp.

   Eyes large, about one-half the diameter of the vertex; median longitudinal sulcus of posterior lobe of pronotum neither expanded nor strigulate; rostrum with erect setae next the head; scutellum with very evident median carina; anterior coxae over twice as long as wide, angulated or not.......3

3. Fore coxae with a distinct angulated process below at apical third .... *coxalis* Mc. and Mall.

   Fore coxae unangulated below............................4

4. Basal segment of antennae not nearly twice as long as second segment (10:8) with hair incumbent, not longer than diameter of segment (♀); posterior lateral angles of the connexival segments not spinose produced; hair of the posterior tibia (♀) incumbent, not longer than tibial diameter .... *pallidus* Barb.

   Basal segment of antennae more nearly twice as long as second segment (10:6) with long semi-erect hairs plainly longer than diameter of the segment (♂ & ♀); posterior lateral angles of the connexival segments commonly spinose produced; hairs of the posterior tibia semi-erect, much longer than tibial diameter.................... *acuminatus* Say

CALIFORNIA COLLECTING NOTES II.

By A. C. Davis, Santa Ana, Calif.

During the season of 1930 a few rarities in Coleoptera have come under observation, and the localities, dates, and circumstances of capture are here recorded for the benefit of collectors who may be working in Southern California in the future.

Cicindela nevadica Lec. was taken about a flowing spring on the edge of the playa near Saltdale, about 35 miles northeast of Mojave, on July 21. The beetles are easily captured when seen, being comparatively weak fliers although moderately wary. *Cicindela praetextata* Lec. also occurs here in small numbers, as well as *C. oregona* Lec., *C. pseudosenilis* W. H., *C. haemorrhagica* Lec., and *C. pacifica* Schp.

Acmaeodera postica Fall. Several specimens were taken from the Mountain Mahogany, *Cercocarpus beteloides* Nutt., on the lower five or six hundred yards of the trail from Sierra Madre to Mt. Wilson on June 8. These insects are not as active as most of the genus, spending more time in resting upon the foliage. They are sluggish in flight and not easily alarmed, and are quite easily captured by beating.

Glyptoscelimorpha marmorata Horn was beaten from the California Juniper, *Juniperus californicus* Carr., in the low hills south of Palmdale on July 21, near Fairmont on August 2, and at Ft. Tejon on August 30. Near Palmdale they were fairly plentiful. They are not easily alarmed and may be secured quite readily by beating.

Desmocerus californicus Horn was taken in small numbers during the latter part of March and the early part of April upon elder (*Sambucus glaucus* Nutt.) near Atwood, Orange Co. In the morning the beetles are quite active, the males especially flying about the trees. In the afternoon they are quiet, resting upon the foliage or limbs, and not moving about very much.

Moneilema spoliatum Horn was taken in some numbers from the common flat-leaved *Opuntia* on the Cajon Pass road, about five miles north of San Bernardino, on July 31 and August 17. They are most numerous just after sundown, when they come out from hiding to feed upon the cactus. They are conspicuous when seen, but may be easily mistaken for an *Eleodes* which is also occasionally taken upon the cactus. This *Moneilema* was also taken from *Opuntia bigelovii* Engelm. in Red Rock Canyon in 1927 by Mr. R. E. Barrett.

Anthonomus heterogenus Dtz. was beaten from *Sphaeralcea* (*Malvastrum*) sp. at Laguna, from April to June. This species occurs in fair numbers, along with *Anthonomus ochreopilosus* Dtz. As far as I know, this species has not hitherto been recorded from California.

Notes on Eurymus eurytheme Boisduval.—The appearance of this handsome butterfly at various points in southern Massachusetts during the past autumn was noted by this collector in greater numbers than in any previous year. The captures listed below represent only a portion of the number of these insects actually seen. It would seem as if at least one generation passed through all stages of life in our region. Possibly the exceptionally dry weather throughout the fall of 1930 may be a contributing factor to this development.

Dr. Elmer T. Learned examined male genitalia of specimens taken September 6th, 25th, and October 2nd, confirming identification of species.

Sept. 6, '30. 2 ♂, 1 ♀—8th fairway, Acoaxet Club, Westport Harbor, specimens not fresh.

Sept. 25, '30. 3 ♂, 3 ♀—Field off Quarry St., Fall River, Mass. Specimens in superb condition.

Oct. 2, '30. 3 ♂—Field off Quarry St., Fall River, Mass. Two in good, one in fair condition.

Oct. 9, '30. 2 ♂—Field off Quarry St., Fall River, Mass. Both specimens in good condition.

Oct. 22, '30. 1 ♀—19th fairway, The Country Club, Brookline, specimen in rubbed condition.

Nov. 11, '30. 1 ♀—5th fairway, Acoaxet Club, Westport Harbor, Mass. Rubbed specimen.

The brilliant colored specimens of September 25, and October 2, closely resemble the illustrations of the form *Keewaydin* on plate 15, part 1; and plate 21, part II, of W. H. Edwards' Butterflies of North America.

W. Prescott Rogers,
Fall River, Massachusetts.

COCCOIDS COLLECTED ON WILD PLANTS IN SEMI-ARID REGIONS OF TEXAS AND MEXICO (HOMOPTERA).

By F. F. Bibby, Agricultural Experiment Station, College Station, Texas.

Below is a list of Coccoidea which were collected on wild plants in semi-arid regions of Texas and Mexico, mostly, however, in Hidalgo County of the Lower Rio Grande Valley of Texas. In every instance the locality (or localities) in which the coccoid was taken is listed, as is the host (or hosts).

The coccoids were collected in 1922, 1926, 1927 and 1928, and were identified by Dr. Harold Morrison of Washington, D. C., unless otherwise noted. The hosts were identified by the late Professor H. Ness and Mr. V. L. Cory, both of the Texas Agricultural Experiment Station, by Dr. Paul C. Standley of the U. S. National Museum, and by Dr. Frederick V. Coville of the U. S. Department of Agriculture. The common names of the plants (placed in parentheses after the technical ones) were learned from obliging Mexicans in the interior of Mexico and along the Texas-Mexico border. In most instances these are the only names by which the plants, in their habitats, are known to the inhabitants.

The species are listed under their respective families, along with the hosts and localities, as follows:

Asterolecaniidae.

Lecaniodiaspis sp. on bark of
Populus sp. (álamo) at
Presidio, Presidio County, Texas.

Solenococcus sp. nearest to *artemisiae* (Ckll.) on
Amyris parvifolia A. Gray (barreta) and
Ricinella vaseyi C. & F. at
Mission, Hidalgo County, Texas.

Dactylopiidae.

Dactylopius tomentosus (Lam.) on
Opuntia sp. at
Mission, Hidalgo County, Texas.

Pseudococcidae.

Pseudococcus sp., or a closely related genus; quite possibly undescribed; on
Salix sp. at
Mission, Hidalgo County, Texas.[1]

Lacciferidae.

Tachardiella mexicana (Comst.) on
Pithecolobium flexicaule (Benth.) Coulter, (ébano),
Pithecolobium brevifolium Benth.,
Acacia amentaceae DC (chaparro prieto),
Acacia farnesiana (Linn.) Willd. (huisache), and
Prosopis chilensis (Molina) Stuntz (mezquite) at
Mission, Hidalgo County, Texas.

Coccidae.

Ceroplastes cirripediformis Comst. on
Karwinskia humboltiana Zucc. (coyotillo) at
Mission, Hidalgo County, Texas.

Ceroplastes irregularis Ckll. on
Atriplex canescens (Pursh.) James at a point locally known as Fossil Hill, between Alpine and Terlingua, Brewster County, Texas.

Diaspidae.

Aspidiotus coursetiae Marl. on bark of
Celtis pallida Torr. (granjeno),
Leucophyllum texanum Benth. (cenizo),
Amyris parvifolia A. Gray (barreta),
Xanthoxylum pterota H. B. K. (colima),
Cercidium floridum Benth. (retama or palo verde),
Karwinskia humboltiana Zucc. (coyotillo),
Porliera angustifolia (Engelm.) A. Gray (guayacán),
Pithecolobium brevifolium Benth., and
Ricinella vaseyi C. & F. at
Mission, Hidalgo County, Texas, and on
Acacia sp. (largoncillo) at
Chihuahua, Chihuahua, Mexico.

---

[1] Associated with this pseudococcid were two species of ants determined by Dr. W. M. Mann as *Pseudomyrma gracilis* var. *mexicana* Roger and *Crematogaster lineolata* var. *clara* Mayr.

Aspidiotus sp. very close to *coursetiae* Marl. on
Salix sp. and
Amyris parvifolia A. Gray (barreta) at
Mission, Hidalgo County, Texas.

Aspidiotus diffinis Newst. on leaves of
Porliera angustifolia (Engelm.) A. Gray (guayacán) at
Mission, Hidalgo County, Texas.

Aspidiotus herculeanus D. & H. on
Acacia farnesiana (Linn.) Willd. (huisache) at
Mission, Hidalgo County, Texas.

Aspidiotus juglans-regiae Comst. on
Salix sp. at
Presidio, Presidio County, Texas.

Aspidiotus lataniae Sign. on
Baccharis neglecta Britton (jara china),
Condalia obovata Hooker (abrojo), and
Prosopis chilensis (Molina) Stuntz (mezquite), galls of, at
Mission, Hidalgo County, Texas, and on
Cercidium floridum Benth. (retama or palo verde) at
Weslaco, Hidalgo County, Texas.

Aspidiotus subsimilis Ckll.[2] on bark of
Prosopis chilensis (Molina) Stuntz (mezquite) at
Tlahualilo, Durango, Mexico, and
Jatropha spathulata (Ort.) Muell. (sangre de drago) at
Mohovano, Durango, Mexico.

Chionaspis sp. that does not agree fully with any of our species, resembling European *C. salicis* (Linn.) more nearly than American *C. salicis-nigrae* (Walsh); also resemlbing *C. longiloba* Cooley in some respects and *C. corni* Cooley in others; on
Salix sp. at
Mission, Hidalgo County, Texas.

Chrysomphalus sp. closest to *apicatus* Newst. and *phenax* Ckll., not certainly identical with either, perhaps undescribed, on
Celtis pallida Torr. (granjeno) at
Mission, Hidalgo County, Texas.

[2] Identified by Mr. G. B. Merrill of the Florida State Plant Board.

Chrysomphalus sp. closest to *apicatus* Newst., quite possibly undescribed, on
Salix sp. at
Mission, Hidalgo County, Texas.

Chrysomphalus sp. close to *lilacinus* Ckll. on
Acacia berlianderi Benth. at
Mission, Hidalgo County, Texas.

Chrysomphalus sp. closely related to *perseae* (Comst.) and *albopictus* (Ckll.) on leaves of
Pithecolobium flexicaule (Benth.) Coulter (ébano) at
Mission, Hidalgo County, Texas.

Chrysomphalus scutiformis (Ckll.) on leaves of
Porliera angustifolia (Engelm.) A. Gray (guayacán),
Pithecolobium flexicaule (Benth.) Coulter (ébano), and
Phaulothamnus spinescens A. Gray (panalero or ojo de víbora) at
Mission, Hidalgo County, Texas.

Chrysomphalus sp. on galls of
Prosopis chilensis (Molina) Stuntz (mezquite) at
Mission, Hidalgo County, Texas.

Diaspis echinocacti cacti Comst. on
Opuntia leptocaulis DC. at
Mission, Hidalgo County, Texas.

Diaspis texensis (Ckll.) on
Koeberlinia spinosa Zucc. (junco) and
Castela nicholsoni Hooker (amargosa), leaves of, at
Mission, Hidalgo County, Texas.

Diaspis sp. near *townsendi* Ckll. on
Unidentified plant at
Mission, Hidalgo County, Texas.

Pseudodiaspis yuccae (Ckll.) on bark of
Acacia berlianderi Benth. and
Acacia farnesiana (Linn.) Willd. (huisache) at
Mission, Hidalgo County, Texas.[3]

[3] On each of the hosts, this diaspid was being destroyed by an entomogenous fungus determined as *Sphaerostilbe coccophila* (Desm.) Tul. by Vera K. Charles of the U. S. Department of Agriculture.

Lepidosaphes mimosarum (Ckll.) on
Prosopis chilensis (Molina) Stuntz (mezquite),
Pithecolobium flexicaule (Benth.) Coulter (ébano), and
Pithecolobium brevifolium Benth. at
Mission, Hidalgo County, Texas.

Lepidosaphes sp. close to *mimosarum* (Ckll.) on
Acacia sp. probably *farnesiana* (Linn.) Willd. at
Castolon, Brewster County, Texas.

Lepidosaphes sp. on
Atriplex canescens (Pursh.) James at a point locally known as Fossil Hill, between Alpine and Terlingua, Brewster County, Texas.

Targionia yuccarum (Ckll.) on
Baccharis sp. at
Presidio, Presidio County, Texas.

Xerophilaspis prosopidis Ckll. on
Prosopis chilensis (Molina) Stuntz (mezquite) at
Castolon, Brewster County, Texas.

Pseudoparlatoria parlatoroides (Comst.) on
Porliera angustifolia (Engelm.) A. Gray (guayacán), leaves of, and
Amyris parvifolia A. Gray (barreta) at
Mission, Hidalgo County, Texas.

References.

Coulter, John M. 1891–1894. Botany of Western Texas. Contributions from the U. S. National Herbarium. Vol. II. Div. of Botany, U. S. D. A.

Felt, E. P. and Morrison, Harold. 1926. Family Coccidae, in List of the Insects of New York. Memoir 101 of Cornell Univ. Agr. Exp. Sta., pp. 193–202.

Fernald, Maria E., Mrs. 1903. A Catalogue of the Coccidae of the World. Bull. No. 88 of the Hatch Exp. Sta., Mass. Agr. Coll.

Lobdell, Gladys H. 1930. Twelve New Mealybugs from Mississippi (Homoptera: Coccoidea). Ann. Ent. Soc. Amer., Vol. XXIII, pp. 209–222.

Morrison, Harold. 1926. A Classification of the Higher Groups of the Coccid Family Margarodidae. Tech. Bull. 52 of the U. S. D. A.

Pellett, Frank C. 1923. American Honey Plants. Second Edition. Published by Amer. Bee Jl., Hamilton, Ill.

Ramírez, José and Alcocer, Gabriel. 1902. Sinonimia Vulgar y Científica de las Plantas Mexicanas. Published by Oficina Tipográfica de la Secretaria de Fomento, Mexico, D. F. (Mexico).

Small, John Kunkel. 1913. Flora of the Southeastern United States. Second Edition. Published by the Author, N. Y. C.

Sudworth, George B. 1927. Check List of the Forest Trees of the United States. Misc. Circ. 92 of the U. S. D. A.

BOOK NOTES.

My Nature Book, or Notes on the Natural History of the Vicinity of Dunedin, Florida. By W. S. Blatchley. (Pp. 1–302 + I–XV. Nature Publishing Co., Indianapolis, Ind. $2.)

Dr. Blatchley gave us not long ago in his " Blatchleyana," an interesting and inspiring list of the tangible results of his scientific labors of a life-time. Now, in this his latest work, he sets before us the animating spirit of his life in this narrative of his many years in Florida. It is an American companion to " The Natural History of Selborne," and no one but him could have written it. A work such as this—a record of actual living—is not one on which to base a critique or to make an analysis. It defies dismembering, just as life does; and just as life, it is fascinating, and, in a way, elusive. To all those who love nature because they feel their essential and unescapable tie with it, this latest work of Dr. Blatchley's will be delightful.

On the biological side, it is full of informing observations on beast, bird, insect and plant. In a way, there is a sadness in the thought that our boasted civilization, so-called, brings about the profanation of nature; and reduces its beauty to cement sidewalks and selected city lots. The harmonious charm of free nature is superseded by raw, unkempt, gashed earth. Trees, flowers, birds and insects flee or are destroyed. And the realtor points to another profitable development, a crudeness and a crassness where once loveliness reigned.

This is a book to be taken up and enjoyed now and again, for a moment or for an hour of withdrawal from the itching hurry that is our daily life.

A Textbook of Agricultural Entomology. By Kenneth M. Smith, D.Sc., Ph.D. (Pp. 1–xiii + 1–285; Cambridge: at The University Press; New York: The Macmillan Company. $4.25.)

This is an English book, which shows a number of things. The outside wrapper bears the statement " The need for an up-to-date text-book on the subject has long been felt " in Great Britain. It seems that the latest extensive work on economic entomology to be published in England dates back to 1860! Dr. Smith's aim is to bring the subject down to recent times and recent findings.

Again, while our recent American works (Essig, Metcalf and Flint, Wardle) are compendious tomes running to and beyond a thousand pages each, here we have a serious work on the same subject covering it adequately in 285 pages. There are two reasons for this: the restricted and climatically homogeneous area covered; and the relatively few economic insects afflicting agriculture in Britain. In the True Bugs, for instance, four species only are mentioned, all mirids, three of which we have in our country. The latter are *Calocoris norvegicus, Lygus pabulinus* and *Lygus pratensis.* There appear to be no pentatomids (although *Eurydema oleracea* and its congeners attack Cruciferae elsewhere in Europe); no coreids, no pyrrhocorids, no tingids injurious to plants in England or Scotland. On the other hand, plant lice appear to be well-represented; and the injurious Lepidoptera, Coleoptera and Diptera take up more than three-quarters of the book.

From our American point of view, this work has two distinct values: it indicates sufficiently the nature of the British insect problems; and it furnishes life-history and ecological data about a great number of insects that have been or may be imported into this country; and which, from the nature of their native climate may well naturalize themselves among us successfully, just as *Lygus pabulinus, Crioceris asparagi* and *Pontia rapae* (to mention just a few among many) have already successfully done.

As a book, it is finely printed on excellent paper, with a good-looking buckram cover in blue with gold lettering. The 80 figures are fine and very well reproduced.

This is a work of value primarily to economic entomologists; and then to those other entomologists whose interest in insects goes beyond the taxonomic problems they present, to the more interesting, the more significant and (the sordid argument) the more utilitarian aspects of life histories and ecology.

The Arachnid Order Chelonethida. By Joseph Conrad Chamberlin. (Stanford University Publications, University Series, Biological Sciences, vol. vii, no. 1; pp. 1–284, figs. 1–71. 1931. Stanford University Press; paper, $2.00; cloth, $2.50.)

We mention this important work here to draw attention to it on two grounds. On the one hand, it is a complete treatment of the group; and on the other, it is a splendid example of what a monograph ought to be (and frequently is not). The two main divisions of the work treat respectively of the morphology and the taxonomy of the order. The numerous morphological studies and figures afford a solid foundation for the taxonomy of the group.

Entomologists *sensu strictu* could fruitfully contemplate this work as an example of what may be accomplished in a monograph. The writer is in no way competent to pass on the morphological or taxonomic findings. Dr. Chamberlin's fellow-arachnologists will doubtless do so in due time, to their own edification, at least; but as a reader of much monographic work, it is possible to me to form a justifiable opinion of what is acceptable. The work before me, from this standpoint, is a perfect exemplar.—J. R. T.-B.

While it is not always done (ethically), we wish to bring to the notice of our readers the various publications (catalogues, leaflets, etc.) of the General Biological Supply House of Chicago. We find these most interesting and a fine source for brief and practical replies to the many queries we get on biology in general and particularly on apparatus for entomology and other branches of biology. Those interested should write this company for its catalogues.

A Record of Polyembryony.—A small lot of buckeye chestnut burrs, collected at Fort Davis, Davis Mountain, Texas, in early October, 1930, contained the larva of a Pyralid boring into the ripe nuts and in some cases spinning a loose, flat cocoon between the nut and its shell covering. Two moths emerged, one in February and the other in May, 1931. They have been determined by Mr. Carl Heinrich, of the U. S. National Museum, as *Myelois venipars* Dyar. During May the breeding jar also contained a lot of very minute parasites, estimated at about 500. Another lot of the same parasites equally numerous hatched in August. These were referred to Mr. Gahan, of the National Museum, who says that they are a *Copsidosoma* sp., family Encyrtidae; and that they, like most of the species of this family, are polyembryonic.—George P. Engelhardt, Hartsdale, N. Y.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

BYRRHIDAE—Wish to exchange local Coleoptera for Byrrhidae of World. Correspondence solicited. K. W. Cooper, 40–40 167th St., Flushing, N. Y.

BUTTERFLY COLLECTORS—Have you butterflies which look different in color or pattern from the average? (See advertisement). Please write. Jeane Gunder, Pasadena, Calif.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

HISTERIDAE—Desire to obtain material, all localities, for identification, by purchase or exchange of other families. Chas. A. Ballou, Jr., 77 Beekman St., New York, N. Y.

CATOPINAE.—American *Catops, Choleva, Ptomaphagus, Catopomorphus, Prionochaeta, Echinocolus, Dissochoetus* wanted by Dr. René Jeannel, 57 rue Cuvier, Paris 5, France.

LOCALITY LABELS.—60c per 1000, 5 in strip, 1 to 3 lines. Good heavy paper. Prompt service. A. L. Stevens, 691 Culver Rd., Rochester, N. Y.

WILL collect all orders of insects about this locality for those interested. Louise Knobel, Hope, Arkansas.

MEMBRACIDAE OF THE WORLD.—Specimens desired from all localities; will purchase, exchange material in other groups, or make determinations for duplicates. Everett C. Lerch, Staten Island Museum, Staten Island, N. Y.

Vol. XXVI DECEMBER, 1931 No. 5

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, Editor

CARL GEO. SIEPMAN GEO. P. ENGELHARDT

Published for the Society by the
Science Press Printing Co.,
Lime and Green Sts., Lancaster, Pa.,

Price, 60 cents Subscription, $2.50 per year

Mailed January 30, 1932

Entered as second-class matter January 21, 1919, at the post office at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

CONTENTS

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $2.50 per year; foreign, $2.75 in advance; single copies, 60 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and communications to

J. R. de la TORRE-BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXVI December, 1931 No. 5

ON THE FEMALE GENITALIA OF THE MICROLEPIDOPTERA AND THEIR IMPORTANCE IN THE CLASSIFICATION AND DETERMINATION OF THESE MOTHS.

By August Busck, Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C.

The female genitalia of the Lepidoptera present, as do those of the males, very complicated structures, which are of great value in the proper classification of this order of insects.

The females of the primitive suborder of the *Lepidoptera,* the *Jugatae,* including the families *Hepialidae, Micropterygidae, Mnesarchaeidae,*[1] and *Eriocraniidae,* have a single sex opening at the end of the abdomen just below the anal opening, serving both for copulation and for oviposition. This condition obtains also in the order *Trichoptera,* from which the *Jugatae* originated.

[1] The family *Mnesarchaeidae* consists of a single small New Zealand genus; the female genitalia were described by the late A. Philpott (Trans. N. Zealand Inst., vol. 57, p. 715, figs. 1, 2, and 3, 1926). Because of limited material this conscientious and able worker was unable to satisfy himself about these structures, and his description mistakenly suggests that two genital openings are present. To quote my lamented friend: "The ductus bursa opens in the concavity of this piece" (the sternite of the eighth abdominal segment).

Through the kindness of Dr. G. V. Hudson, of Wellington, New Zealand, the writer has been enabled to study a female of this family (*Mnesarchaea loxoscia* Meyrick) and finds that there is only one genital opening at the end of the abdomen, as in other *Jugatae.* Mr. Philpott's description and figures of these structures are otherwise as accurate as his other work on *Microlepidoptera.*

The other, more specialized suborder of the Lepidoptera, the *Frenatae,* consists of two major groups, according to the type of the female genitalia. The females of one group have, like the *Jugatae,* retained the single sex opening, while the females of the other major group, which comprises by far the greater number of species, have, as is well known, an even more complex genital system with two sex openings, one serving for copulation and one for oviposition.

In the *Jugatae,* two forms of single-opening genitalia are found. In the most primitive families, the last joints of the abdomen are soft and retractible and the genital opening together with the anal opening is surrounded by a more or less bilobed soft ovipositor at the tip of the abdomen. The eggs are laid on the surface of the foodplant or just dropped broadcast near the food, hence there is no need of a piercing ovipositor, and the chitinized rods (the posterior and anterior apophyses) from the last segments forward, which serve for muscle attachment in the higher Lepidoptera, are not developed. Such is the condition found in the *Hepialidae, Micropterygidae,* and *Mnesarchaeidae.*

The family *Eriocraniidae,* on the other hand, inserts the eggs into the food plant; the abdomen is strongly chitinized, greatly modified, and terminates in a strong ovipositor, supported by strong apophyses for attachment of muscles.

In the *Frenatae* with single sex opening there are likewise two forms of genitalia, corresponding by and large to the two forms in the *Jugatae.* One group has more or less soft, unspecialized, bilobed and hairy ovipositors, much like those of *Micropteryx,* though the terminal joints have short apophyses and other chitinized modifications of details. The families *Nepticulidae, Tischeriidae,* and *Opostegidae* belong to this group and are presumably direct descendants from micropterygid stock.

The other group of *Frenatae* with one sex opening have piercing ovipositors like the *Eriocraniidae,* and are presumably derived from eriocraniid stock. This group consists of the families *Incurvariidae, Prodoxidae, Adelidae, Crinopterygidae,* and *Heliozelidae.*

The insects of both of these groups, the so-called *aculeate Microlepidoptera* (Spüler), possess another archaic character in common with the *Jugatae* in the minute spines (*aculea*) between the scales on the wings, which are actually a part of the wing membrane, not attached in follicles as are the hairs and scales.

This character also is an inheritance from the *Trichoptera,* in which it is prevalent.

It should be realized, however, that of these two fundamental characters the number of sex-openings is absolute and therefore by far the more dependable one. Transition forms must, of course, have existed at some time, but the change is a very ancient one and, as far as we know, no species in the transition stage has survived.

The wing aculeation, on the other hand, is in its nature a character which could be expected to disappear gradually without the necessity of other structural modification, and such is found to be the case. While all the forms with one genital opening possess aculeation, it has become much reduced in area in *Opostega,* and the aculeation has persisted, though much scattered and reduced, in certain forms with two genital openings in the family *Tineidae* and even in some higher families.

The single sex-opening was first pointed out in the genus *Nematois* by N. Cholodkowsky (Uber den Geschlechtsapparat *Nematois metallicus* Poda, Zeitschrift für Wissenschaft. Zoologie, vol. 42, 1885) and has been demonstrated since by Wilh. Petersen (Mem. de L'Academie Imp. St. Petersburg, series 8, vol. 9, no. 6, 1900) and others in the families *Adelidae, Incurvariidae,* and *Nepticulidae.*

A typical American example of the females with *single sex opening* is found in the Yucca moth, *Tegeticula alba* Zeller (*Pronuba yuccasella* Riley), the genitalic complex of which is given schematically in Plate IX, figure 1.

The several oviducts from the large curved *ovaries* (Ova.) unite into one enlarged *oviductus communis* (Ovid.), in which the actual fertilization of the eggs presumably takes place. The oviduct narrows into a slender egg-laying tube (Ovid.), which can be extended long beyond the opening of the chitinized, sharp-pointed, and sharp-edged ovipositor (Ovip.) formed by the ninth segment. This segment is prolonged forward into the body in two long, slightly curved, chitinized processes, the so-called *posterior apophyses* (P. A.), or segmental rods, which serve for the attachment of the muscles which move the ovipositor in and out. The male sperm is introduced through this same egg tube, which at the time of copulation is withdrawn to the end of the ovipositor, and it finds its temporary storing place in the large oval *bursa copulatrix* (B.), the duct (D.) of which unites with the narrow tube-like part of the oviduct near the tip of the abdomen in the eighth abdominal segment; this segment is strongly chitinized, and entirely enclosed within the similarly strongly chitinized seventh abdominal segment, from which it can not be protruded; it is prolonged forward into the abdomen in two slender segmental rods, the *anterior apophyses* (A. A.), which serve for muscle attachment. The *ductus bursae* (D.), which thus is also a *ductus seminalis,* has an enlarged part near the middle (E.) with two chitinized rods and covered with strong muscles. This enlarged part may correspond, in function at least, to the *bulla seminalis,* found in some of the groups with two genital openings, or to the *receptaculum seminalis,* and presumably serves the same purpose of temporarily storing and eventually expelling the sperm into the enlarged part of the oviduct. The bursa is large, oval, heavily covered with strong musculature, and contains, in the present species, two opposing, large, striking, star or flower shaped *signa* (Sn.), first described by Hagen (Zool. Anzeiger, 1862). There are a great many variations and modifications of all the characters given; each species has its own peculiar form, but the example given illustrates the common scheme of the genital complex of the group of moths with only one genital opening.

The common European and American Tortricid moth *Cacoecia rosana* L. will serve as an example for the other, numerically much larger group, *with two genital openings,* in the female.

Its abdomen is shown schematically in Plate IX, figure 2. Here we find from the similarly large curved ovaries (Ova.) four oviducts (Ovid.) united into two, and again into one, which leads the eggs into an enlarged *oviductus communis* (O. C.); the oviductus again narrows and terminates at the tip of the abdomen just below or uniting with the anal opening of the digestive system (A.); both are surrounded at their terminus by two soft, flattened, hairy ovipositors (Ovip.), varying in form in different species.

The entrance, the *ostium* (Ost.) to the *bursa* (B.), is widely separated from the egg-laying opening and is found on the ventral side in the intersegmental skin between the seventh and eighth segments, normally surrounded by a chitinized area (the genital plate). Through this opening copulation takes place, the long tube-like male penis penetrating through it, and all the way through the sometimes very long *ductus bursae* (D.) into the capacious bladder-like *bursa copulatrix* (B.), where the sperm is temporarily desposited. The bursa, in the species pictured (and in the entire *Cacoecia* group), is armed on the inside of the wall with a strong, curved, chitinous spine, the *signum* (Sn.) ; in other genera the signum has a different, sometimes a very different, form.

The *ductus bursae* (D.) is connected with the *oviductus communis* (O. C.) by a narrow tube, the *ductus seminalis* (D. S.), which in the species under consideration (and in all *Tortricidae*) has near its middle a large, blind, bladder-like enlargement, the so-called *bulla seminalis* (B. S.), connected by a short narrow tube, *ductus bullae* (D. B.).

Opening into the oviductus communis is the *receptaculum seminalis* (R. S.), a highly specialized, spiraled, last storing place for the male sperm, before it fecundates the eggs as they pass out into the *oviductus communis* (O. C.). Near the end of the oviduct the eggs are given an adhesive coating secreted from two large glands, *glandulae sebaceae* (Gl.), with a common outlet.

The example given shows the general scheme of the female sexual organs in the Lepidoptera with two sex openings, but the details vary greatly in the different families and offer excellent characters for the differentiation of families and genera, as well as for the species.

It is obvious, without discussion, that such fundamental anatomical differences as presented in the two main groups with one and with two sex openings and the consequent internal differences in structure must be expressed in a natural classification.[2]

This has already been effected by Spüler, by his superfamily "*Tineides aculeatae*,"[3] erected on the other archaic character, the

---

[2] Chapman, who believed the single genital opening was confined to the genus *Micropteryx,* even proposed a new order for it —*Zeugloptera*—on this character alone.

[3] *Tineides aculeatae* is an unfortunate term, first, because it does not conform to superfamily terms in general use, and secondly, because the species comprising the group are not "Tineides." I propose to substitute the two superfamily names already in use, *Nepticuloidea* for the families with more or less soft ovipositor in the female, and *Incurvarioidea* for the families with highly specialized piercing ovipositor.

aculeate wings,[4] but it is very inadequately expressed in our English literature, as represented by Meyrick's Handbook and our American checklists. W. T. M. Forbes, however, has utilized these fundamental characters, in part, in his Lepidoptera of New York, 1923.

Any grouping of the Microlepidoptera which does not sharply separate the one-genital-opening forms from the two-genital-opening forms, but which unites some members of each main division within the same family, is clearly unnatural.

The study of the female genitalia, therefore, proves that Meyrick's twelve "phyla" do not express equivalent systematic concepts and that his "tribe" *Tineoidea* is unnatural, because it includes families of both main groups (with single, and with double genital opening), while one family with single genital opening, the *Nepticulidae,* has been singled out, inconsistently, as a separate "phylum."

The application of these studies then give us the more natural arrangement, as shown on Plate XIII, which, with slight modifications, much resembles the phylogenetic table based on wing characters (Busck, Proc. Ent. Soc. Washington, vol. 16, pl. 2, 1914).

As indicated, it is not only the major difference of the one or two genital openings which makes the female genitalia a valuable aid in the classification of Lepidoptera. The modifications of the minor details of the genitalia, such as the form of the *ostium,* the length of the *ductus bursae,* the type of the *signum,* the position of the *ductus seminalis,* the presence or absence of a *bulla seminalis,* and the form of the *ovipositor,* are all useful in the classification, and taken together commonly at once indicate the systematic position of the species.

The *ostium* is usually cup-shaped, margined by a genital plate of various form, more or less flush with the abdominal wall (*Tortricidae, Phaloniidae, Stenomidae, Oecophoridea,* and others), but in some groups (*Cosmopterygidae, Scythridae, Amydria,* and

[4] One of the genera included by Spüler under the *Tineides aculeatae, Meessia* Hoffman (type *vinculella* Herrick-Schaeffer) is misplaced. It has two genital openings and has just a trace of wing aculeation, such as commonly persists in some Tineid genera and even in higher groups. Spüler correctly divided the genus and placed *argentibaculella* as the type of his new genus *Infurcitinea* in the nonaculeates next to *Tinea. Meessia* likewise belongs in the *Tineidae* very close to the American genus *Eudarcia* Clemens.

Meessia), the *ductus bursa* is protruded outside of the body wall as a chitinized tube (usually asymmetrically placed so as to permit copulation from only one side) with the *ostium* at its tip (Plate XII, fig. 16).

The *genital plate* varies in outline in different species; it may be circular, oval, square, or triangular or otherwise; its surface may be smooth, or wrinkled, or pitted, but it is constant within the species.

The *ductus bursae* may be very short, bringing the bursa close up to the *ostium* (*Phaloniidae* and others, Plate 2, fig. 2), or it may be longer, sometimes very long, nearly twice the length of the abdomen, which necessitates a curling or looping of the ductus. In such case, the ductus is commonly chitinized on one side as a guide to the penis (plate XI, fig. 11); in other forms, the ductus is looped once or twice upon itself (*Sparganothidae,* Plate XI, fig. 8) or tightly spiraled (*Smicrotes,* Plate X, fig. 1).

The *ductus seminalis* more commonly arises from the ductus bursae and in such case the point of junction, close to the ostium, or close to the bursa, is significant. In some families (*Gelechiidea*), the *ductus seminalis* is emitted from the bursa.

The *bursa* may be single or double, large or small, round or elongate or irregularly pouched according to the family.

The *signum* may be single or double or absent. These characters are normally of generic significance, sometimes of family value. The signum may be a single sharp thorn with bulbed base (*Cacoecia,* Plate IX, fig. 2), or two small spines (*Laspeyresia*); or it may be a stellate plate (*Peronea,* Plate XII, fig. 17); a flat band (*Amorbia* and *Coelosthathma,* Plate X, fig. 6); an elongate, dentate band or rope (*Sparganothis* and *Cnephasia,* Plate XI, figs. 7, 8, and 9); or a more elaborate structure like those in *Gelechiidae, Stenomidae,* and other families (Plate XII, figs. 13, 14, and 18).

The bursa wall itself may be evenly thick-skinned or may be in whole or part thickened or covered on the inside with short spines, granules, or chitinized plates (*Eulia, Amorbia* and *Sparganothis,* Plate X, fig. 6; Plate XI, fig. 8), or heavily armored with strong spines (*Phalonia,* Plate X, fig. 2).

In many species, the exceedingly extensible penis of the male reaches, during copulation, all the way through the ductus bursae into the bursa, where the spermatozoa are deposited and commonly completely fill it. The extension of the penis is similar in action to the blowing out on an inverted finger in a glove, unrolled from within by blood-pressure, but the penetration of this soft organ through the sometimes very long and looped female ductus can hardly be effected by blood and air pressure of the male alone; it is probably aided by peristaltic motion and suction in the female organ, the bursa being deflated by muscle pressure before copulation and a semivacuum thus created, when the muscles relax.

In many (most) groups of Microlepidoptera, the penis bristles with a formidable armature of sharp spines, the *cornuti,* sometimes fixed and withdrawn again with the penis after copulation, but commonly loosely attached and left in the female bursa (*deciduous cornuti*). These deciduous spines are normally flattened, very sharply pointed, and often nearly as long as the diameter of the female bursa, in which they remain with the spermatozoa after the penis is withdrawn. The purpose of these "lovethorns" is not definitely known. Stitz believes they serve to pierce and break up the congealed surfaces (spermatophores) around the spermatozoa and thus liberate these for their further progress into the ductus communis. The writer is inclined to this view, which, however, is strongly contested by Petersen, who insists that the spermatophores must remain unbroken to fulfill their purpose, as he sees it. He believes that the signum helps to hold in place the smooth-surfaced spermatophores, but this would not explain the deciduous cornuti. Dampf suggests that the cornuti, as well as the signum in the female bursa, serves to excite and stimulate sexual action. Whatever their function, it is indeed remarkable that these exceedingly sharp and stiff spines (which in different species number from one to more than a dozen) are capable of serving their purpose without piercing the comparatively soft and thin skin of the bursa.

In certain Macrolepidoptera (butterflies and Noctuids) Petersen and others have convincingly demonstrated actual containers or capsules for the spermatozoa, the *spermatophores,* which Petersen contends are formed in their final and definite shape in the male penis. According to Petersen these spermatophores are chitinized and remain intact in the female bursa. They are more or less bottle-shaped and the open neck is, in certain forms, exactly the length of the distance from the bursa to the ductus seminalis, into which their contents are squeezed by muscle pressure on the bursa, leaving the empty shell of the spermatophores in the bursa.

In the Microlepidoptera I have not been able to find any such specialized structures, and there at least I believe that the so-called spermatophores are not separate, chitinized structures, but merely the coagulated surface of the mucous or gelatinous fluid surrounding the spermatozoa. That these congealed surfaces, however, in some species, attain a certain toughness and may require the sharp spines of the penis and bursa to tear them open is commonly demonstrated by their persistence through the preparation for the slide-mount, after which they may at times be found intact, either yet filled with spermatozoa or as empty bags within the bursa. This persistence through the boiling in caustic potash certainly suggests the presence of chitin, but the spermatozoa themselves, in preparations of both male and female genitalia, likewise resist to a certain extent the action of potash, and both spermatozoa and spermatophores react alike to color dyes.

The *ovipositor,* in the forms with two genital openings, normally consists of two soft, flattened, hairy lobes, surrounding the anal opening and the outlet for the oviduct. The form of these lobes is constant within the species. In some genera, these lobes are highly specialized, curved, with strongly spined folds (*floricomous ovipositors* Pierce), possibly useful in covering the egg with scales from the abdomen (*Cnephasia* and *Argyrotoxa,* Plate XI, figs. 7 and 9). In other genera, the two lobes are facing each other and partly united into a tube, which, with the long, soft, telescopic last segments of the abdomen, enables the insertion of the eggs into crevices of bark or fruits or into soft and loose material, as cloth, birdnests, and the like (*Tinea* and others). In still other groups, the two lobes of the ovipostior are strongly chitinized and more or less united into a sharp cutting or piercing blade-like organ, which, backed by the chitinized posterior abdominal segments, enables the insertion of the eggs into the foodplants by cutting or piercing the surface (certain *Gelechiidae* and others). This form of ovipositor, however, retains the hairs of the lobes and is merely a chitinized modification of the soft telescopic form just described; it is constructed very differently from the piercing ovipositor found in the aculeate, one-genital-opening forms, as described previously (*Tegeticula*), in which the strongly chitinized eighth segment can not protrude from the seventh and in which the ovipositor (ninth segment) is a completely chitinized, sharply pointed tube, devoid of hairs.

The form of the *ovaries,* of the *oviducts,* and especially of the *receptaculum seminalis,* also yields important characters; the number and relative distance of the spiralled windings of the latter, for example, are constant for the species; but these soft structures are easily lost in the potash treatment and for practical purposes we rely on the other more readily preserved structures of the internal anatomy, the bursa and its accessories.

Finally, the more secondary sexual characters, like cushions of peculiar scaling (Plate X, fig. 4), hairtufts concealed at rest in deep pouches and expansible during sexual incitation, afford some aid in the grouping of Microlepidoptera, but are, of course, of no such taxonomic significance as the structure of the genitalia themselves.

Aside from their great value in the technical taxonomic work of classifying the Microlepidoptera, the female genitalia, as well as those of the males, have a very important practical application, constantly utilized in the determination of material sent in by the field agents of the U. S. Bureau of Entomology, who are studying the economic aspects of insects injurious to crops, like the pink bollworm, the codling moth, and the oriental fruit moth, to give well-known examples.

Such specimens are more often than not in exceedingly poor condition for determination, commonly necessarily so, because of the difficulty of catching and preserving these delicate moths under adverse field conditions, where the study of their biology or of the best methods for destroying them are the prime objects. This holds particularly in cases where light or bait attraction is tested against injurious species and the moths are caught in various traps, normally waterpans with a surface film of oil or baited with molasses and even more so in the investigations of the spread of injurious insects, by flight or air-currents, where the moths are caught on flypaper attached to rapidly moving airplanes.

The moths secured by such methods are necessarily in poor condition, normally devoid of scales, and often with legs, palpi, and wings broken or lost—sometimes mere fragments, apparently unrecognizable. The definite determination of those catches, however, is of course essential in order to decide whether the insects caught are the injurious species intended for investigation and combat, or merely some stray species of no economic value.

While all the appendages and the color of such specimens commonly are lost, and with them the characters on which we formerly relied for their determination, the body is normally intact and the genitalia may be extracted and mounted on a slide in perfect condition for examination under the microscope.

With the gradual and constantly increasing accumulation of more than 10,000 carefully made, definitely determined and classified slides of the genitalia of injurious species, as well as of their innocuous relatives and associates, it is now, in most cases, a comparatively simple task to identify with certainty the insect "criminals," national and international, females as well as males, by their "fingerprints."

Explanation of Plates.

Plate IX.

Fig. 1. *Tegeticular alba* Zeller.
Schematic outline of female abdomen and genital structures in moths with *one* sex opening.

Fig. 2. *Cacoecia rosana* Linnaeus.
Schematic outline of female abdomen and genital structures in moths with *two* sex openings.

Abbreviations Used in Figures.

Nos. 1–9	Abdominal segments.
Ova.	Ovaries.
B.	Bursa copulatrix.
Sn.	Signum.
D.	Ductus bursae.
Ovid.	Oviducts.
A. A.	Anterior apophyses.
P. A.	Posterior apophyses.
E.	Enlarged part of ductus bursae.
B. S.	Bulla seminalis.
D. B.	Ductus bullae.
D. S.	Ductus seminalis.
R. S.	Receptaculum seminalis.
Ost.	Ostium.
Ovip.	Ovipositor.

Plate X.

Female genitalia.

Fig. 1. *Smicrotes peritana* Clemens.
Genotype.

Fig. 2. *Clysia ambiguella* Hübner.
Genotype.

Fig. 3. *Carposina berberidella* Herr.–Schaeff.
Genotype.
Fig. 4. *Templemania animosana* Busck.
Genotype.
Undenuded tip of abdomen, with specialized sex scaling.
Fig. 5. *Templemania animosana* Busck.
Denuded tip of abdomen.
Fig. 6. *Amorbia humerosana* Clemens.
Genotype.

PLATE XI.

FEMALE GENITALIA.

Fig. 7. *Ablabia osseana* Scopoli.
Genotype.
Fig. 8. *Sparganothis pettitana* Robinson.
Fig. 9. *Ablabia argentana* Clerck.
Fig. 10. *Rhacodia emargana* Fabricius.
Genotype.
Fig. 11. *Choristineura parallela* Robinson.

PLATE XII.

FEMALE GENITALIA.

Fig. 12. *Mompha conturbatella* Hübner.
Genotype.
Fig. 13. *Isotrias rectifasciana* Hübner.
Genotype.
Fig. 14. *Polylopha epidesma* Lower.
Genotype.
Fig. 15. *Pseudatteria rivularis* Butler.
Fig. 16. *Cosmopteryx eximia* Haworth.
Genotype.
Fig. 17. *Peronea nigrolinea* Robinson
Fig. 18. *Caenognosis incisa* Walsingham.
Genotype.

(The drawings were made by Mrs. Eleanor A. Carlin under the author's supervision from slides prepared by him.)

LITERATURE CITED.

Busck, August. On the Classification of the Microlepidoptera. Proc. Ent. Soc. Wash., vol. 16, p. 46, 1914.

————. Review, Edw. Meyrick: Revised Handbook of British Lepidoptera, 1928. Can. Entomologist, vol. 60, p. 231, 1928.

Busck, August, and **Heinrich, Carl.** On the Male Genitalia of the Microlepidoptera and their Systematic Significance. Proc. Ent. Soc. Wash., vol. 23, p. 145, 1921.

Chapman, T. A. *Micropteryx* entitled to Ordinal rank; Order *Zeugloptera.* Trans. Ent. Soc. London, p. 310, 1916.

Cholodkowsky, N. Ueber den Geschlechtsapparat *Nematois metallicus* Poda. Zeitschrift für Wissenschaft. Zoologie, vol. 42, p. 502, 1885.

Dampf, A. Ueber innere Begattungszeichen bei Tortriciden. Schriften Physikalisch-ökonomischen Gesellsch. Königsberg, vol. 61, p. 66, 1920.

Forbes, W. T. M. The Lepidoptera of New York and Neighboring States. Cornell University Memoir 68, 1925.

Hagen, H. A. Ueber ein eigenthümliches Organ in der Begattungstache zweier Tineiden. Zool. Anzeiger, vol. 5, p. 18, 1882.

Meyrick, Edw. Revised Handbook of British Lepidoptera, 1928.

Petersen, Wilh. Beitrage zur Morphologie der Lepidopteren. Mem. Acad. St. Petersburg, vol. 9, no. 6, 1900.

————. Die Morphologie der Schmetterlinge und ihre Bedeutung für die Artbildung. Mem. Acad. St. Petersburg, vol. 14, 1904.

————. Ueber die Spermatophoren der Schmetterlinge. Zeitschrift für Wissenschaftliche Zoologie, vol. 88, p. 117, 1907.

————. Die Blattminieregattungen *Lithocolletis* und *Nepticula.* Stett. Ent. Zeit., vol. 88, p. 113, 1927; vol. 91, p. 1, 1930.

Philpott, Alfred. The Genitalia of the *Mnesarchaeidae.* Trans. New Zealand Inst., vol. 57, p. 710, 1926.

————. Notes on the female genitalia in the *Micropterygoidea.* Trans. Ent. Soc. London, pp. 319–323, pl. 27, 1927.

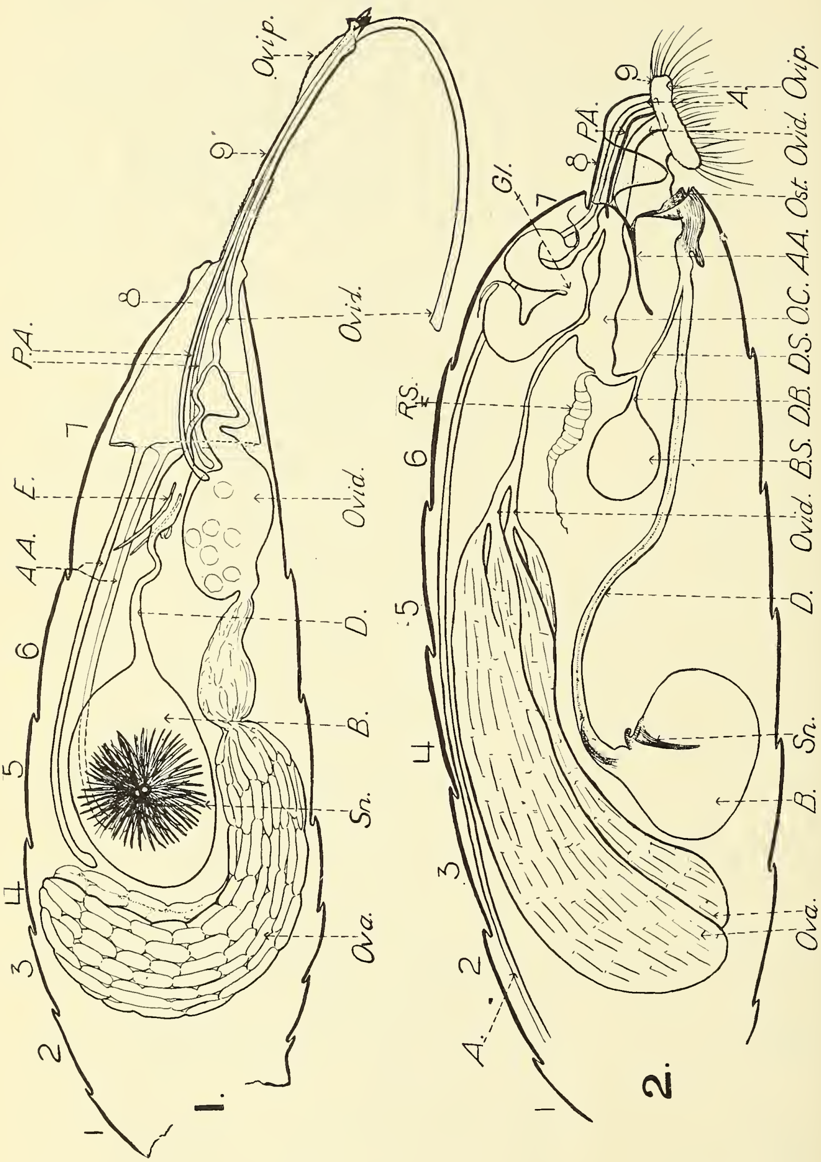
Pierce, F. N., and **Metcalfe, J. W.** The Genitalia of the Group *Tortricidae* of the British Islands, 1922.

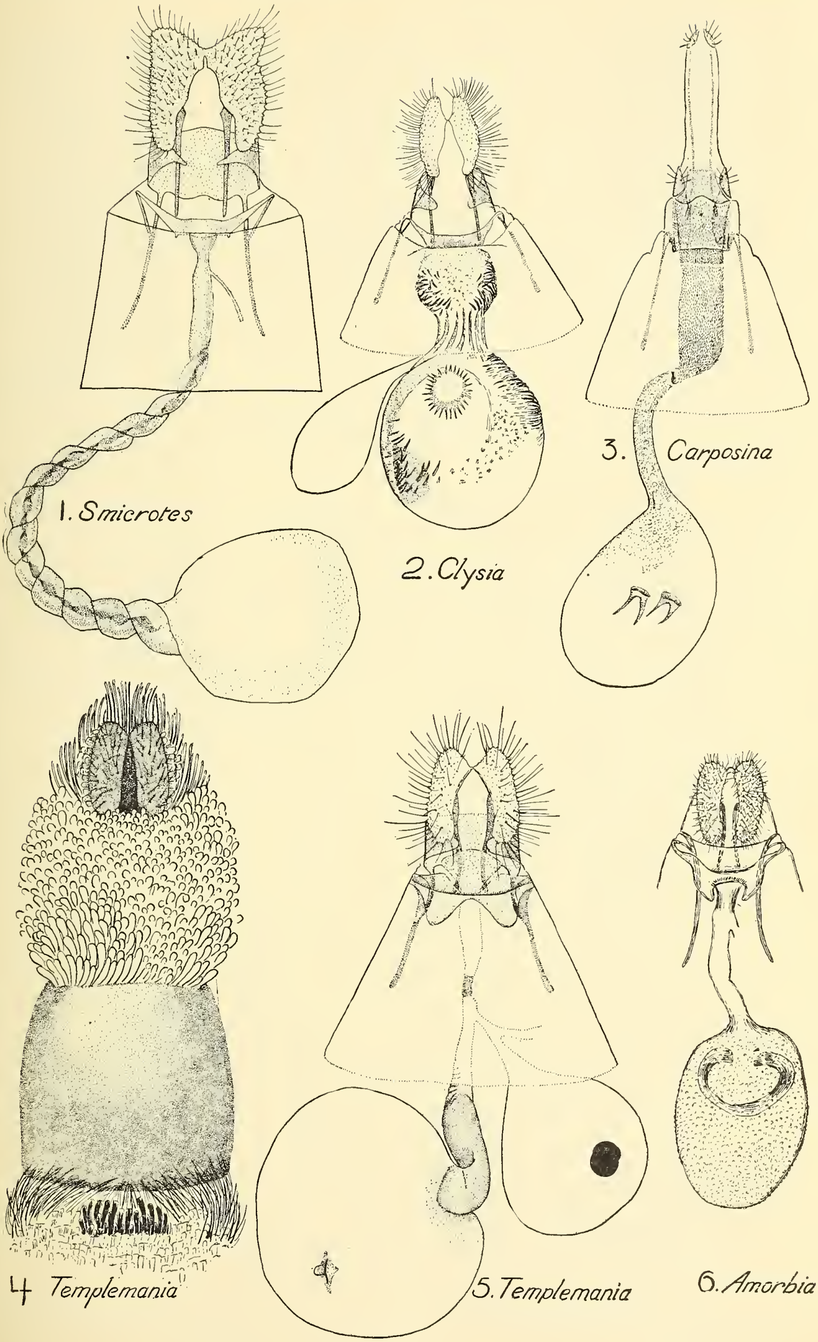
Spüler, Arnold. Die Schmetterlinge Europas, 1910.

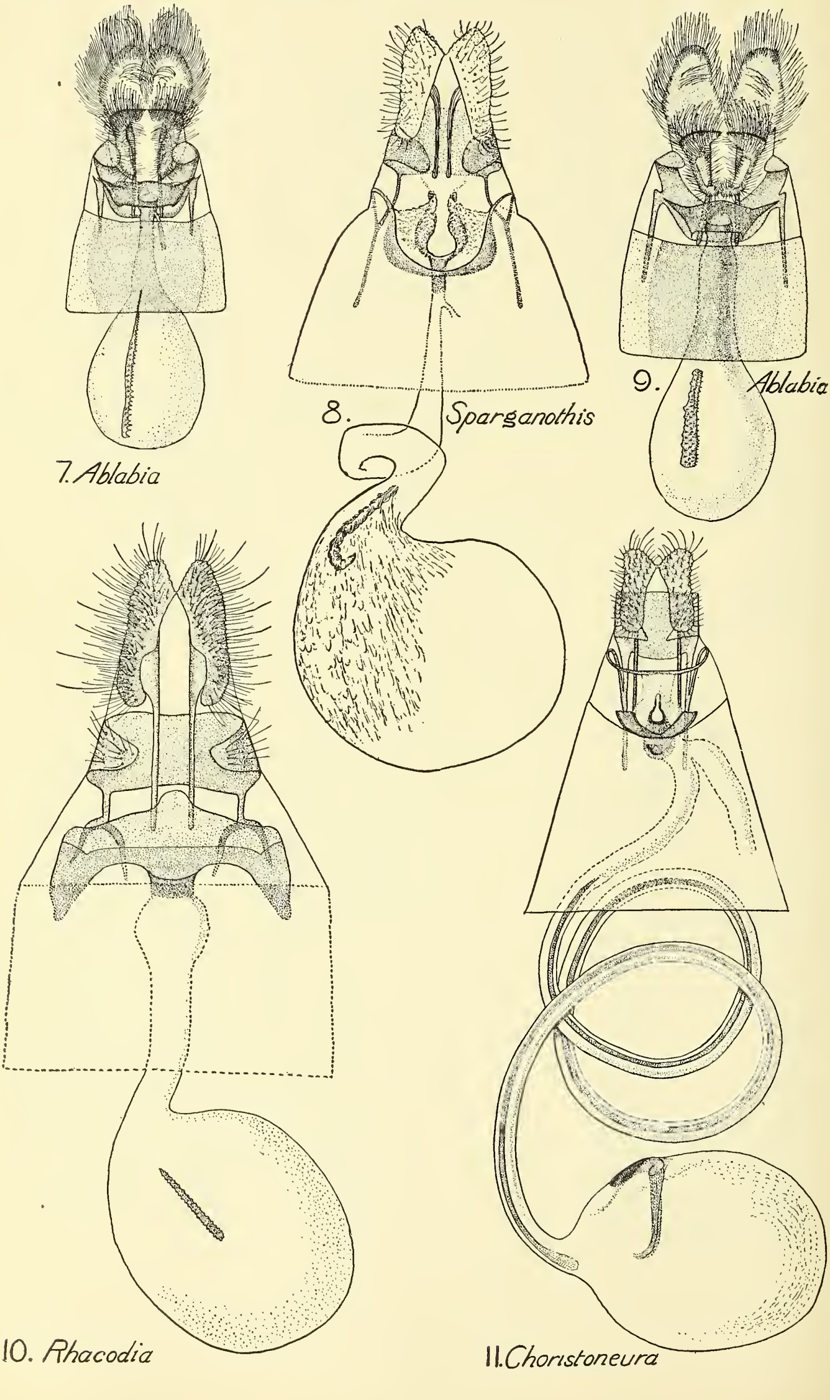
Stitz, H. Der Genitalapparat der Microlepidopteren. Zool. Jahrbücher, vol. 15, p. 385, 1902.

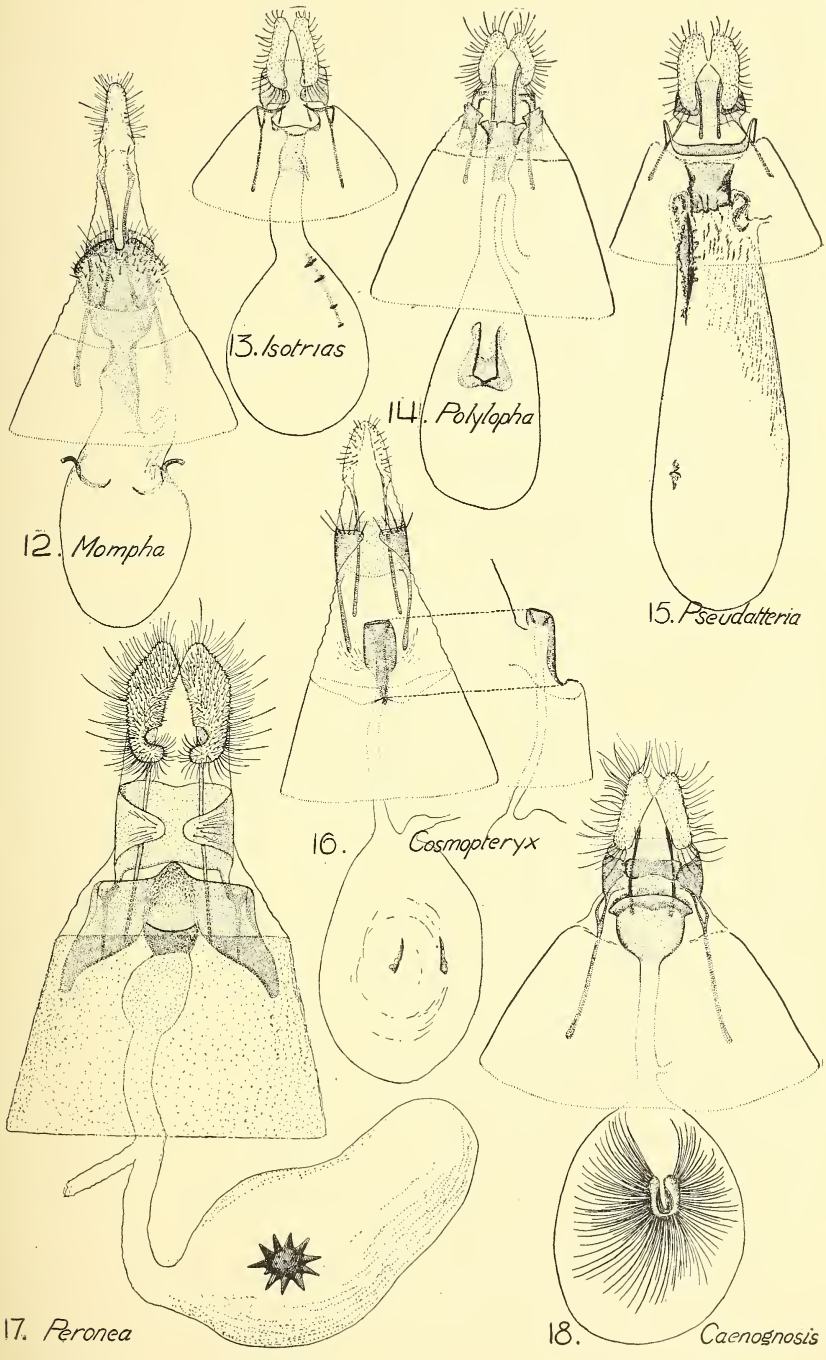
Wood, J. H. A further chapter in the life-history of *Micropteryx.* Ent. Mo. Mag. 2nd. series, vol. 1, p. 148, 1890.

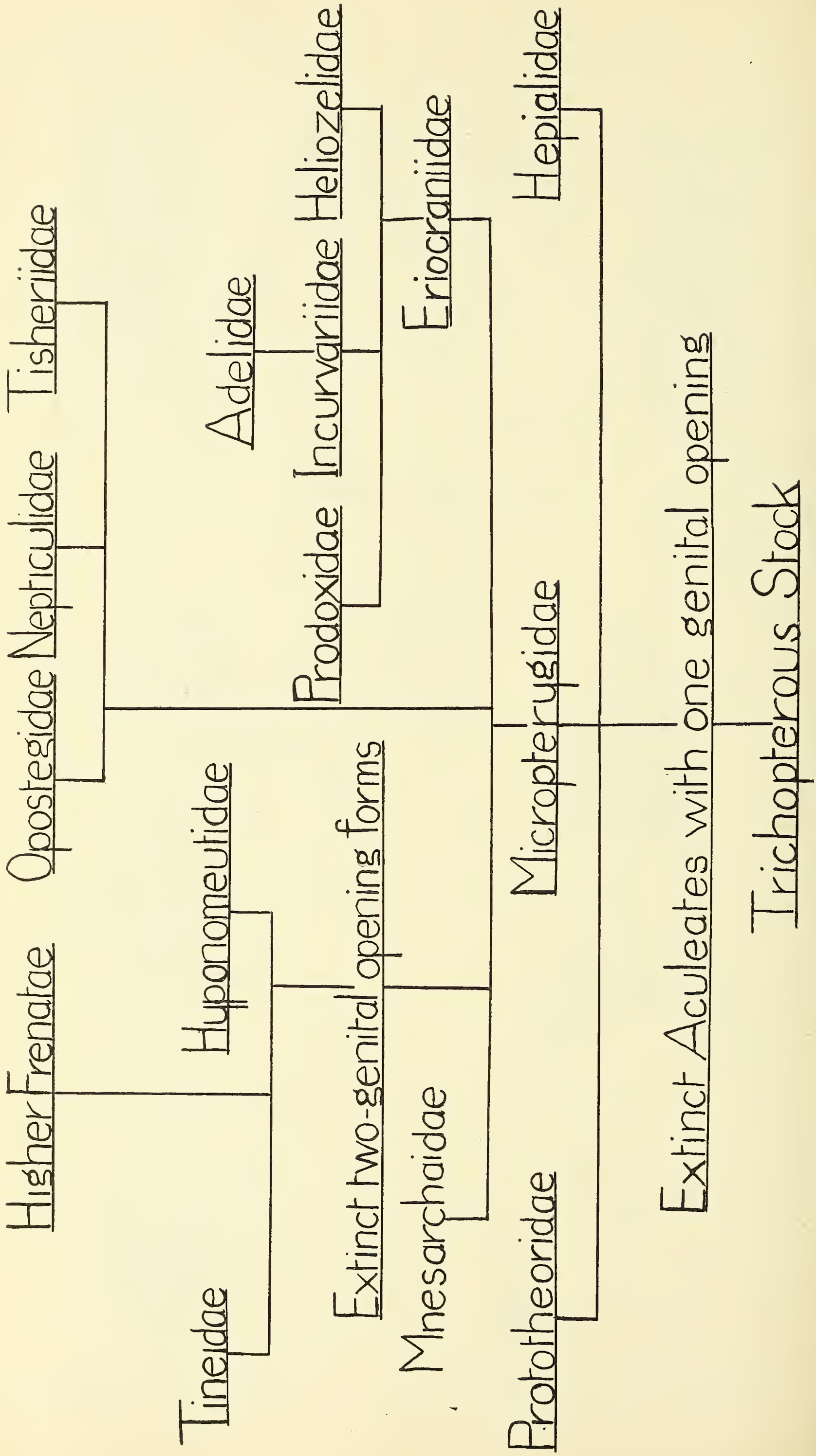
Wood, J. H. On Oviposition and the Ovipositor in certain Lepidoptera. Ent. Mo. Mag. 2nd. series, vol. 2, pp. 175–253, 1891.


Ovip.
9
8
Ovid.
P.A.
7
E.
A.A.
Ovid.
6
D.
5
B.
Sn.
4
Ova.
3
2
1
1.
A.
Gl.
R.S.
A.
Ost.
O.C.
D.S.
D.B.
B.S.
2.


1. Smicrotes
2. Clysia
3. Carposina
4 Templemania
5. Templemania
6. Amorbia


7. Ablabia
8. Sparganothis
9. Ablabia
10. Rhacodia
11. Choristoneura


12. Mompha
13. Isotrias
14. Polylopha
15. Pseudatteria
16. Cosmopteryx
17. Peronea
18. Caenognosis


Higher Frenatae
Tineidae
Hyponomeutidae
Opostegidae
Nepticulidae
Tischeriidae
Adelidae
Prodoxidae
Incurvariidae
Heliozelidae
Eriocraniidae
Extinct two-genital opening forms
Mnesarchaidae
Micropterygidae
Prototheoridae
Hepialidae
Extinct Aculeates with one genital opening
Trichopterous Stock

SEVENTEEN ADDITIONS TO THE COLLEMBOLA OF NEW YORK.

By Elliott A. Maynard, University of Rochester, Rochester, N. Y.

Folsom has recorded[1] from New York 66 species and 5 varieties of Collembola. The present paper adds to that list 13 species and 4 varieties, bringing the total of species and varieties to 88, of which one is unnamed. I am indebted to Dr. Folsom for several of these determinations and for checking several preliminary identifications of my own.

Achorutes pseudarmatus Folsom.

Proc. U. S. Nat. Mus., Vol. 50, 1916, p. 490.

This species was described in 1916 from specimens collected in California and British Columbia. One individual was taken under hickory bark by myself at Rochester, N. Y., March 5, 1931.

Achorutes humi Folsom.

Proc. U. S. Nat. Mus., Vol. 50, 1916, p. 487.

Folsom's type specimens were collected in Illinois, where he found the species abundant in woodlands in damp soil and among dead leaves on the ground. The New York specimens listed below are all of the yellow color form.

Ithaca, N. Y., November, 1927, in leaf mold, R. D. Harwood; Rochester, N. Y., November 15 and 16, 1927, under bark of pine slabs lying on the ground in woods, E. A. M.

Achorutes tigrina Harvey.

Ent. News, Vol. 11, 1900, p. 552.

The original description was based upon eight cotypes taken under bark in a woods at Poronal, Maine. There is in my collection a single New York specimen, which I believe is the second record for the continent, taken at Ithaca, November, 1927, in leaf mold, by R. D. Harwood.

Anurida tullbergi Schött.

Ent. Tidsk, Vol. 15, 1894, p. 128.—Guthrie, Collembola of Minnesota, Rept. Geol. Nat. Hist. Surv. Minnesota, Zool. ser., No. 4, 1903, p. 99.

This species, described from Florida and later recorded from Minnesota, occurs also throughout Europe. It is found on the

[1] A List of the Insects of New York, by M. D. Leonard, Memoir 101, Cornell Univ. Agr. Exp. Sta., 1928, pages 12–17.

seashore, under or among débris, and on the surface of quiet pools. Inland, it is found in similar situations pertaining to bodies of fresh water. Material is at hand from Lakeville, N. Y., October 9, 1927, under board in wet soil on shore of Conesus Lake, E. A. M.

Neanura quadrioculata Guthrie.

Rept. Geol. Nat. Hist. Surv. Minnesota, Zool. Ser., No. 4, 1903, p. 101.—Folsom, Proc. U. S. Nat. Mus., Vol. 50, 1916, pp. 512–513.

This rare species was described from Minnesota. Folsom later recorded specimens taken in Maryland. Three specimens were taken at Van Etten, N. Y., November, 1927, in leaf mold, by R. D. Harwood.

Onychiurus pseudarmatus Folsom.

Proc. U. S. Nat. Mus., Vol. 53, 1917, p. 646.

The type specimens were collected on St. Paul Island, Alaska, and I believe the following is the second record of the species:

Van Etten, N. Y., November, 1927, two specimens in leaf mold, R. D. Harwood.

Onychiurus octopunctatus Tullberg.

Öfv. K. Vet.-Akad.-Handl., Vol. 10, 1876, No. 10, p. 40.—Schött, K. Svenska Vet.-Akad.-Handl., Vol. 25, 1893, No. 11, p. 88.—Folsom, Proc. U. S. Nat. Mus., Vol. 53, 1917, p. 647.

This very rare species was described from a unique type collected at Dudinskoe, Siberia. The specimens recorded by Schött were collected by the Yenisei Expedition at Tschulkova and the Vega Expedition at Irkaipi, in Chukchi Land. Folsom's record is of three specimens from Alaska. My material consists of one specimen from leaf mold, taken by R. D. Harwood at Van Etten, N. Y., November, 1927.

Agrenia bidenticulata Tullberg.

Öfv. K. Vet.-Akad. Förh, Vol. 28, 1871, No. 1, p. 152.

This common European species was described from Sweden, and I believe that it has not heretofore been recorded from North America. A good series was taken at Rochester, N. Y., March 21, 1931, on the surface of a sulphur spring, by S. C. Bishop.

Isotoma trispinata MacGillivray.

Can. Ent., Vol. 28, 1896, p. 51.

MacGillivray's material was collected at Salineville, Ohio. At Rochester, N. Y., March 9, 1927, I found it very common in moss (*Polytrichum* sp.) growing in a low open field.

Isotoma palustris Müller var. *prasina* Reuter.

Öfv. Finsk. Vet. Soc. Förh., Vol. 33, 1891, pp. 226–229.—Folsom, Report of the Canadian Arctic Expedition, 1913–1918, Vol. III, Insects, Part A, Collembola, 1919, p. 12.

This variety, described from Siberia, is known throughout northern and middle Europe, the Bismarck Archipelago, Nova Zembla, and Ellesmere Land, according to Folsom. It is also recorded from the Canadian Northwest territories and Demarcation Point, Alaska, by Folsom. My New York material is from Lakeville, Oct. 9, 1927, under sticks on lake shore, E. A. M.

Tomocerus flavescens var. *flavescens* Tullberg.

Öfv. K. Vet.-Akad. Förh., Vol. 28, 1871, p. 149.—Folsom, Proc. Wash. Acad. Sci., Vol. 4, 1902, p. 99.

The typical bidentate form of *Tomocerus flavescens,* described from Sweden, is said by Folsom to be rare but widely distributed in this country. He records it from Illinois, Tennessee, California, and Washington. A few specimens were taken in leaf mold at Ithaca, N. Y., Nov., 1927, by R. D. Harwood.

Tomocerus flavescens Tullberg var. *arcticus* Schött.

K. Sv. Vet.-Akad.-Handl., Vol. 25, 1894, No. 11.—Folsom, Proc. U. S. Nat. Mus., Vol. 46, 1913, p. 459.—Folsom, Proc. Wash. Acad. Sci., Vol. 4, 1902, p. 99.

This form was described from Siberia by Schött and relegated to varietal rank by Folsom when recording it from Alaska, Washington, and Oregon. The only New York specimens seen are from Ithaca, and were taken November, 1927, in leaf mold, by R. D. Harwood.

Heteromurus nitidus Templeton.

Trans. Ent. Soc. London, Vol. 1, Pt. 2, 1835, pp. 89–98 (*Podura nitida*).—Packard. Syn. Thys. of Essex County, Mass., 1873, p. 36 (*Lepidocyrtus marmoratus*).

This is a common European species, recorded from Massachusetts by Packard. It is not uncommon at Rochester, New York. The only lot available for study was taken by myself Nov. 16, 1927, under pieces of wood lying on the ground.

Sira nigromaculata Lubbock.

Monograph of the Collembola and Thysanura, Ray Society, 1871 (1873), p. 146.—Harvey, Psyche, Vol. 7, 1894, p. 159 (*Seira mimica*).—Mills, Can. Ent., Vol. 62, No. 9, 1930, p. 202.

This is one of our most interesting species. Lubbock's description is based upon specimens taken "on dry woodwork." In 1894, Harvey recorded specimens from Maine (under the name *Seira mimica*) as occurring about the windows of the college building as high up as the fourth story, about paper waste in the cellar, and among books on library shelves. In 1903 Guthrie reported from Minnesota: "I have taken the species but once. On Sept. 19, 1899, a dozen specimens were found on the outer stone window sill of a third-story window of Pillsbury Hall at the University." Mills records the species from Iowa with the remark that it is seldom taken except in buildings. My material is as follows:

Rochester, N. Y., Dec. 6, 1927, in biological laboratory on third floor, E. A. M.; Rochester, N. Y., Feb. 24, 1927, under dead hickory bark in company with *Sira buskii* Lubbock, E. A. M.

Lepidocyrtus curvicollis Bourlet.

Mem. Soc. Agr., etc., Nord., Douai, 1843, p. 105.

I believe the following specimens to be the first record of this common European species for North America.

Mendon Ponds, N. Y., Oct. 14, 1930, under bark and in moss on log lying in bog, E. A. M.

Lepidocyrtus cyaneus Tullberg var. *cinereus* Folsom.

Am. Mus. Nov., No. 108, 1924, p. 9.

Although described from New York, this variety was apparently omitted inadvertently from the state list of insects in 1928. It occurs abundantly throughout the state, usually under bark. Material in my collection is listed below.

Rochester, N. Y., Feb. 8, 1927, under bark, E. A. M.; Mendon Ponds, N. Y., Oct. 14, 1930, under bark of log lying in bog, E. A. M.

Sminthurus aureus Lubbock.

Trans. Linn. Soc., 1862, p. 589.—Mills, Can. Ent., Vol. 62, No. 9, 1930, p. 203.

This common European species has been reported from Iowa by Mills, and has been taken by me at Rochester, N. Y., November 12 and 16, 1927, under sticks and bark lying on the ground in woods.

THE EFFECTS OF TEMPERATURE AND MOISTURE ON THE EGGS OF EPILACHNA CORRUPTA MULSANT (COCCINELLIDAE, COLEOPTERA).[1]

By Louis Pyenson[2] and Harvey L. Sweetman, Massachusetts State College, Amherst, Mass.

It has been shown (Sweetman and Fernald, 1930) that the egg stage of the Mexican bean beetle is a very critical one, as embryonic development is greatly influenced by temperature and moisture. However, the complete limitations of temperature and moisture were not established in that paper. The purpose of this study was to determine the effects of temperature and moisture on the egg stage of the bean beetle throughout the ranges for these factors.

Review of Literature

Very few workers have studied the effects of temperature and moisture on the egg stage of the bean beetle in controlled environments. The most complete paper on this subject is that of Sweetman and Fernald (1930). These workers did not expose the eggs to many temperature conditions below 22° C. and relative humidity conditions below 60 per cent; thus were unable to establish definite zonal limits for low temperature and low humidity. Later Marcovitch and Stanley (1930) published some data on the effects of these factors on the incubation of the eggs. They did not measure the moisture conditions around the eggs in their experiments, but apparently the humidity was high. Their data are too limited from which to draw additional conclusions to those of Sweetman and Fernald.

Methods Used

The temperature was controlled with electrical heating units operated with thermostats. The relative humidity was maintained by the use of saturated salt solutions in closed pint fruit jars, and measured with a dew-point apparatus (Marvin, 1915).

The pieces of leaves containing the eggs were fastened to cardboard strips with shellac. This was done to avoid the difficulty,

---

[1] Contribution from the Entomological Laboratory of Massachusetts State College.

[2] Honors Student in Entomology, 1930–1931.

reported by Sweetman and Fernald, produced by the drying and curling of the leaf tissues which injured some of the eggs and prevented the emergence of some of the larvae. The shellac dried quickly and no injury to the eggs was apparent. The strips of cardboard with the eggs were placed in open vials which were suspended in the humidity jars.

Experimental Results

A series of temperatures ranging from 7° to 32° C. at intervals of 5°, except near the maximum and minimum effective temperatures, where the intervals were smaller, were used. The eggs were exposed to a wide spread of humidities at the different temperatures.

A constant temperature of 7° and 12° C. was below the minimum effective temperature regardless of humidity conditions (Table I). These eggs were exposed for about three weeks, then removed to room temperature (22°) with the humidity jars, but no development occurred. A microscopical examination at this time showed that very little, if any, development had taken place before death in the low temperature condition.

About fifty larvae from two lots of eggs were exposed shortly after hatching to a temperature of 7° C. with about 70 per cent relative humidity, but all died within a few days after hatching. An ample supply of suitable food was furnished to the larvae.

A variable temperature of 13.5° to 15° C. did not hatch any eggs with low humidity, an occasional egg with high humidity, and only 16 per cent. with 77 per cent. humidity. About 10 per cent. of the embryos were well-developed in the dry condition. Apparently the average temperature was near 15° as the results are very similar to those obtained in constant temperature conditions at 15°.

A temperature of 15° C. was unsuitable with low humidity, but 12 per cent. of the eggs hatched in the 95 per cent. moisture condition. Probably a much better hatch would have occurred in a 75 per cent. humidity environment with this temperature.

An exposure of the eggs to a low temperature of 12° C. for two separate twelve-hour periods, and to 17° the remainder of the incubation period, with 77 per cent. humidity, produced a 49 per cent. hatch. This shows that short exposures to a temperature slightly below the minimum effective temperature, with favorable humidity, may permit good hatching of the eggs.

A constant temperature of 17° C. was very favorable with high moisture conditions of 74 to 94 per cent., unfavorable with 37 per cent., and unsuitable with 26 per cent. relative humidity. The eggs in the moist atmosphere were covered with a fungus growth, that developed on the bean leaf tissue. Apparently the eggs were not attacked by the fungus. The length of the incubation period was approximately the same in all conditions where eggs hatched.

Good hatches of the eggs resulted in 22° C. conditions with humidities above 75 per cent. The leaf tissues were attacked by a fungus without perceptibly injuring the eggs in the moist condition. Low humidities were very unfavorable as only a few eggs hatched in 20 and 32 per cent. conditions. Well-developed embryos were in most of the remaining eggs in the latter condition, but were unable to emerge. Many larvae died with their heads protruding from the egg coverings, either being too weak or the egg coverings too dry and stiff to allow them to emerge from the egg. The length of the incubation period was about 12 per cent. less in high than in low humidities.

The effects of a temperature of 27° C. with different humidities is very evident. A low humidity of 25 per cent. is still unsuitable, while 58 per cent. permitted a little over half of the embryos to develop and emerge. Humidities of 76 and 81 per cent. gave about the same results as at 22°, but higher moisture environments reduced the percentage of hatch. This shows that 27° is less favorable than 22°, but still within the zone of economic importance.

A temperature of 30° C. is unfavorable for embryonic development. None of the eggs hatched in 20 per cent. moisture conditions, and only 2 per cent. in the 57 per cent. condition. The most favorable humidity, 76 per cent., yielded 27 per cent. of larvae, thus showing that 30° is very unfavorable and is near the maximum effective temperature. A smaller hatch occurred in the wetter conditions, with none of the eggs hatching in the saturation environment. The shorter incubation period occurred in the 76 per cent. relative humidity chamber.

The embryos failed to develop in the 32° C. conditions regardless of the humidity contest of the environment. When 32° was alternated with 22° the percentage emerging was intermediate to the number obtained in the constant conditions.

Summary

A temperature of 7° C. was entirely unsuitable for embryonic or young larval development.

A temperature of 12° was unsuitable for incubation of the eggs in all moisture conditions. The embryos were dead at the end of three weeks. Short exposures for twelve hours at a time did not prevent hatching of about half of the eggs when exposed to 17° during the remainder of the incubation period.

A temperature of 15° was very unfavorable, but a few eggs hatched in the wet environment. The incubation period required 23 days. An exposure to a variable temperature of 13.5° to 15° gave about the same results as in 15° continuously.

A temperature of 17° was favorable for good hatching in 74 and 94 per cent. moisture environments, but the hatch was greatly reduced in 37 per cent., and none hatched in the 26 per cent. condition. The incubation period required 10 to 11 days.

A temperature of 22° is near the optimum temperature with all humidities. This is the only temperature in which some of the eggs hatched in all humidities from 20 per cent. or above. The number of eggs hatching was low in the 20 and 32 per cent. conditions, while good hatches occurred in the moist environments. The incubation period required from 6.5 to 8 days.

A temperature of 27° was favorable with high humidities and unfavorable with dry conditions. The best hatches occurred with 76 and 81 per cent. moisture environments. The incubation period required 5 to 6 days.

A temperature of 30° was unfavorable; about one-fourth of the eggs hatching with 76 per cent. humidity, and none hatching with 20 and 100 per cent. moisture conditions. The incubation period required from 5 to 5½ days.

A constant temperature of 32° was very unfavorable in all humidity conditions. When alternated with 22°, with high and low humidities, the results were intermediate between those obtained in 32° and 22° constant environments.

Conclusions

The eggs of the Mexican bean beetle hatch best in an environment of about 22° C. and 75 per cent. relative humidity. The minimum effective temperature is near 13.5° and the maximum effective temperature near 30°. The best humidity is near 75 to 80 per cent. Low humidities below about 55 per cent. are very unfavorable in all temperature conditions. High humidities of 95 to 100 per cent. are unfavorable except near the optimum temperature.

Literature Cited

Marcovitch, S., and **Stanley, W. W.** 1930. The climatic limitations of the Mexican bean beetle. Ann. Ent. Soc. Amer. 23: 666–86.

Marvin, C. F. 1915. Psychrometric tables for obtaining the vapor pressure, relative humidity, and temperature of the dew point. U. S. Dept. Agr., Weather Bureau Bul. 235: 1–87.

Sweetman, Harvey L., and **Fernald, H. T.** 1930. Ecological studies of the Mexican bean beetle. Mass. Agr. Exp. Sta. Bul. 261: 1–32.

Table I. The effects of temperature and moisture on the eggs of the Mexican bean beetle.

Relative humidity	Total number of eggs	Total number hatched	Per cent. hatched	Days to hatch
		Temperature 7° C.		
39	71	0	0	—
77	118	0	0	—
95	59	0	0	—
		Temperature 12° C.		
37	145	0	0	—
77	154	0	0	—
98	148	0	0	—
		Temperature 13.5° C. to 15° C.		
37	185	0	0	—
77	323	51	15.8	23.5
98	191	2	1.0	26.0
		Temperature 15° C.		
28	355	0	0	—
38	276	0	0	—
95	146	18	12.3	23.0

Temperature 12° C. twice for 12 hrs.; 17° C. rest of time				
77	301	147	48.8	13.1
Temperature 17° C.				
26	394	0	0	—
37	212	67	31.6	10.9
74	232	193	83.2	10.7
94	146	125	85.6	10.7
Temperature 22° C.				
20	324	2	0.6	7.8
32	150	11	7.2	7.9
76	129	93	72.0	7.4
78	126	99	78.6	6.6
81	109	89	81.6	6.7
84	147	97	66.0	6.6
97	183	164	89.6	6.7
Temperature 27° C.				
25	97	0	0	—
58	262	148	56.5	5.9
76	250	178	71.2	5.9
81	351	251	71.5	5.6
97	192	123	64.1	5.5
100	213	149	69.9	5.0
Temperature 30° C.				
20	130	0	0	—
57	337	6	1.8	5.5
76	231	63	27.3	5.2
97	349	78	22.3	5.4
100	204	0	0	—
Temperature 32° C.				
17	46	0	0	—
76	41	0	0	—
97	62	0	0	—
100	337	0	0	—
Alternating Temperature 8 hrs. at 32° C. — 16 hrs. at 22° C.				
17–31	114	0	0	—
76	109	71	65.1	7
97	114	67	58.8	7

SOME PSYCHODIDAE FROM THE CAROLINA MOUNTAINS.

By Nathan Banks, Cambridge, Mass.

During a trip in late August and early September in the Smoky and Black Mts. I found Psychodidae fairly common at most streams. Some of them were taken on the Tennessee side of the Smoky Mt., about a mile from Newfound Gap, but these are included, also some records made in the Black Mts., twenty years ago, and also one species from the Johnson collection and one sent me by Mr. C. S. Brimley. Several species were taken by Dr. F. M. Carpenter, and others I owe to kindness of Mr. Darlington. These make a total of twelve species.

I have used *Pericoma* for those species in which the antennae are large at base, and quite suddenly become small, and are short; in these forms the forks of third and sixth vein are equally far basad, and before middle of wing; in *Psychoda* the fork of third vein is much further out.

Psychoda alternata Say.

From Willets, Nantahala Gorge, and near Blowing Rock.

Psychoda cinerea Bks.

Mt. Mitchell, and near Newfound Gap on the Tennessee side.

Psychoda albipuncta Will.

From Raleigh, June (Brimley). Previously known from South Carolina and from Florida and widely spread in the West Indies.

Psychoda bicolor Bks.

From Deep Creek, Bryson City, 23 August, and Newfound Gap, 31 August.

Psychoda autumnalis Bks.

From Willets, 24 August.

Pericoma nitida Bks.

From Nantahala Gorge, 25 August.

Pericoma basalis Bks.

On the State Road to Newfound Gap, Tennessee side, 2 September.

Pericoma marginalis Bks.

From Willets, 24 August, and near Newfound Gap.

Pericoma albitarsis Bks.

Very common; Willets; Nantahala Gorge; Deep Creek, near Bryson City; near Newfound Gap; and from Blowing Rock to Linville.

Pericoma interrupta Bks.

One from Hot Springs (Slosson) in the Johnson collection.

Pericoma signata Bks.

North fork of the Swannanoa River, Black Mts., in late May.

Pericoma carolina sp. nov.

Head and thorax with white hair, thoracic notum yellowish; abdomen with mostly gray and white hair; femora pale and with white hair; tibiae with mostly white hair but some near tip are dark; tarsi with gray to black hair. Wings lightly marked with mostly dark hairs along the veins, some white toward base and at middle; dark patches over the bifurcations; fringe on costal margin dense, and black to end of first vein, from there to eighth vein unbroken snow white, rest of hind margin with dark fringe, except a little white at extreme base. Wings about medium width, forks of third and sixth being about equally far basad, much before middle of wing; vein 5 ends a little behind extreme tip of wing. Antennae hardly one-half the width of wing, basal joints large, others very slender and scarcely bulbous.

Length of fore-wing 2.8 mm.

From Deep Creek, Bryson City, N. C., 26 August, and North fork Swannanoa River, May.

The white legs and long stretch of white apical fringe readily separate the species.

SEPARATES, REPRINTS, EXCERPTS, EXTRAS.

By J. R. de la Torre-Bueno, White Plains, N. Y.

We find some feeling remarks on tendencies in these forms of publication, or better, of distribution of publications, in *Entomological News* for November, 1931 (vol. xlii, no. 9, pp. 257–258).

This terminology of separata (or separates), reprints, excerpts and extras is employed very loosely by all parties concerned—authors, publishers and booksellers. At times the practice implied by this terminology has lent itself (or has been bent) to particular acts not consonant with the technical meaning of "publication." Definition of these terms may help to a correct and circumscribed idea of the meaning and implications of each.

Separata (or *separates*) means something separately printed—obviously something *apart* and distinct from a general publication.

Reprint signifies something printed *again* from an article or book already in existence. An entire book, in this sense, may be a reprint—or any portion of it of a complete nature, as a chapter.

Excerpt means something *taken out of*—as a quotation, long or short, not necessarily in printed form—it may be written or typed. It always implies a part of a work *taken out.*

Extra is an article *reproduced in toto* for the author's use and benefit; it may also mean in a general sense, an additional printing of anything beyond a fixed number.

All four terms have been and are constantly used to cover the same thing—namely, the independent printing of an article out of a journal for a restricted circulation.

A *separate* may be an independent publication not appearing in any journal. It is then susceptible to the accepted rules for publication in the technical sense. The far-famed Hüber's *Tentamen* is a true *separate.* A separate may also be something printed separately (that is, apart or distinct) from the body of a journal.

By extension, a *reprint* may be an article reproduced for the author by a journal out of its contents.

An *excerpt* can be neither. It is something taken out of the body of a journal or of a book. An article or a chapter torn out from an existent journal or book is the only thing to which it could be applied. Excerpt is also used in the same sense as *quotation*; obviously, a book-seller, no matter how smart he may be, can scarcely extemporize a market for such fragments.

By custom, authors of technical papers receive as a courtesy from the journal in which they appear, a limited number of printed copies of their articles. These are *author's extras*; consequently, they may not be designated by any other name.

The strict interpretation of these terms would abolish such heartburnings as assail Mr. J. D. Gunder. He attacks the practice of booksellers in taking apart journals and selling the separate articles. Yet, many serial publications, particularly in past times, seemingly anticipated this practice, since all their articles are separately paged. Other journals start and end each article in such a manner as to allow it to be removed entire without injury to the others. Booksellers who had odd numbers of journals, *in illo tempore* when excerpts could be sold separately to advantage, did this very thing, to the great profit of all concerned. After all, to object to a bookseller's terminology in this respect is mere caviling. There is no particular aura of authority or sanctity about an author's extra that makes it more to be desired than the same article under any other form or any other term. An excerpt with a personal dedication from the author has a sentimental value—which leaves its scientific and technical worth just where it was before, neither more nor less.

For myself, I say more power to the bookseller who makes available for me a wanted article at a reasonable price and in a more usable form. I am saved the expense of a complete set of a costly journal; and have just what I want and no more.

In his last Catalogue (October, 1931), Mr. John D. Sherman, Jr., lists "REPRINTS." Under this heading he has lumped everything—separata proper, reprints, excerpts and author's extras. This is a loose usage, of course, but he has merely followed custom. Those familiar with the literature of their special groups are well able to distinguish—if they wish to or have any interest—the character of any of these publications. It is not difficult for a hemipterist to know that Dufour's *Récherches anatomiques sur les Hémiptères* is a true *separate*—not a reprint nor an excerpt nor an author's extra. Many others might be cited, the origin of which is readily to be known. On occasion, this Catalogue names the source of a reprint.

Of course, it is extraordinarily reprehensible that a bookseller's catalogue should not be an annotated bibliography. But we should be thankful for the real usefulness of what we do get. In any event, all bookseller's catalogues are now extremely succinct—the cost of printing enforces the most extreme terseness.

THE AUTOMOBILE AS AN INSECT COLLECTOR.

By H. T. Fernald, Orlando, Fla.

Probably nearly every one has noticed butterflies caught by the front of the radiator of automobiles, but no particlar attention seems to have been paid to the subject.

For several years the writer has observed the butterflies of *Pieris monuste* on cars during the spring migration southward of this insect without realizing how numerous and varied captures of insects by cars really were. But during a stay in New England during the summer of 1931, followed by a trip through the Atlantic Coast States to Florida, in October, his attention was again drawn to the number of insects captured in this way.

The chief points observed were: the species concerned and their abundance; their distribution; and the number of cars showing captures. Of course it was impossible to learn how far each car met on the road had gone since its radiator had been cleaned. Some, undoubtedly, had travelled but a few miles at most; and it was also impossible to determine how fast the car had gone, though this is certainly an important item. Personal observation of the captures by the writer's own car indicate, however, that when going at less than thirty miles per hour few insects are caught, but that the number increases with increasing speed in spite of the fact many are caught up in the air currents formed by the rapidly moving car and swept to one side. Then, too, many which hit the car are not held by it but drop to the road and may be seen there, crippled, fluttering, or killed by the collision.

During July and August in New England not many insects were noted on car radiators. Perhaps one car of a dozen showed some kind of an insect, most often *Eurymus philodice,* though in a few cases a Fritillary was observed and a small Satyr in one instance. An occasional small Dragon-fly (not a Damsel-fly) or a Tabanid, and in one case a portion of a Cerambycid beetle made up the list where examination was possible. Evidently the usual captures would be of insects flying rather low, frequenting roadsides, and differing with the nature of these. Thus, the Sulphurs and Fritillaries were probably picked up on sunny stretches; the Satyr where the road was shady, and the Dragon-flies either in the sunny places or where the road ran near water, according to the species concerned.

In Eastern Pennsylvania during July the insects caught by the cars were about the same, both in kinds and abundance, but specimens of the Japanese beetle were also occasionally found—not enough, unfortunately, to make the automobile a factor in the control of this pest!

Similar conditions and species were observed in Maryland, but in one case a *Eurymus eurytheme* was found.

Not until after leaving Washington did any great increase in the abundance of insects captured become evident. Perhaps this was partly due to the density of population north of Washington and a corresponding reduction in mileage of the cars, most of them presumably going only short distances. Beyond Washington settlements became farther apart and even local cars would need to increase their mileage considerably. Butterflies flying, also became more abundant and as a result, probably, of these two factors, more insects were observed on cars and in greater numbers, sometimes as many as six or eight.

By the time South Carolina was reached butterflies were very abundant along the roads and Southern species, such as *Dione vanillae* and *Catopsilia eubule* were in evidence and beginning to appear on the radiators. Ten or a dozen insects, mostly butterflies of course, were often seen now on a single car and more cars had collected some. In Georgia and Florida the chief change was an increase in the abundance of insects along the roads, and a corresponding increase of them on the radiators. The two butterflies just named formed the bulk of the insects caught, but an occasional *Zerene caesonia* and one *Eurema euterpe* or *delia,* too poorly preserved for positive identification, were noticed. Dragon-flies of medium to small size; an occasional beetle, and grasshoppers, with the butterflies seemed to form most of the species caught except for some of the larger Tabanids. These last often acted in a curious manner when the car was standing still, flying and darting against the car hood in a most vicious way and producing a noticeable sound or "bang" as they hit it. One Mayfly and one Ant-lion adult have also been noted on a car radiator though not during the particular trip considered here.

The attention of the writer was, as already stated, first attracted to this subject by the abundance on car radiators in the spring, of the butterflies of *Pieris monuste.* This butterfly has a very noticeable spring migration southward along the Indian River on the East Coast of Florida, extending at least two hundred miles from North to South and continuing during a period of over a month. Yet, during this time there are hardly any specimens to be found five miles west of the river. Accordingly, farther in toward the middle of the State a car which has come in from the Coast at this time can be recognized easily by the butterflies on its radiator, often twenty to thirty or even more, and so closely covering it as seemingly to interfere seriously with its functioning!

No Monarchs, Viceroys nor Papilios have been seen on car radiators thus far by the writer. Apparently those butterflies which fly most strongly can avoid the car or make use of the strong air currents produced by it when rapidly moving and are swept to one side. The almost entire absence of examples of *Eurema* in the catch, however, though very abundant along the roads, may perhaps, be because of the low flight of these insects which is rarely more than a foot high, thus hardly reaching the bottom of the radiator and placing them where the air current from in front of the car under it would carry them away.

Two cars which had been driven a considerable distance at night also have been available for examination. Here, two examples of *Utetheisa bella* were recognized, also fragments of other moths, beetles and Ant-lion adults. From what was found on these cars it is not unlikely that if there were as much long distance driving at high speed at night as in the daytime the insects taken would be quite numerous.

These observations lead the writer to the belief that while the automobile can hardly be considered as very helpful in the control of pests, it collects a much heavier toll of insect life than has been generally supposed.

DISTRIBUTIONAL STUDIES ON SOUTHEASTERN RHOPALOCERA.

By A. Glenn Richards, Jr., Entomology Department, Cornell University, Ithaca, N. Y.

The following records and observations are based upon seven years collecting by the author in Clarke Co., Georgia; parts of six summers spent in the mountains of north Georgia, Tennessee and North Carolina, and the summer of 1930 spent at Monteagle, Tenn. During this time voluminous notes were obtained upon distribution and time of flight, so that an attempted zonal analysis of the butterflies of northern Georgia and the adjacent parts of Tennessee and North Carolina will form a major portion of this paper. In addition the author is greatly indebted to Mr. Lucien Harris, Jr., of Atlanta, for permission to use material from his "A List of the Butterflies of Georgia" (Trans. Georgia Naturalist Club. Jan., 1931, vol. 1, no. 1: 1–27),[1] and other data furnished by him, and to Mr. Henry K. Townes, Jr., of Greenville, S. C., who has allowed the use of his records from that region. The author also wishes to thank Dr. J. Chester Bradley, of Cornell, for permission to use certain notes made by him while in Georgia some years ago, and the various persons who have read and kindly criticized the MSS.

Among literature we find a "List of Rhopalocera of Fulton Co., Ga.," by William J. Mills, Atlanta, 1905 (privately printed). A few notes from this are included, but unfortunately a number of his identifications seem certainly erroneous—(*"Rusticus scudderi"* (he omits *pseudargiolus* which must be what he meant), "*Brephidium exilis*" (*isophthalma*?), and "*Lerema hianna*" (*accius*?)). Quite recently Lucien Harris, Jr., has published a state list, as noted above, including very brief notes for each form (dates largely omitted). Theodore L. Mead[2] and Henry Skinner[3] each give records closely paralleling my own except as noted under *Polygonia comma* (Harr.), *faunus* (Edw.) and *Satyrodes*

---

[1] Obtainable from the Emory University Museum, Emory, Ga. $1.

[2] "Butterflies on Grandfather Mountain, North Carolina." Can. Ent. Dec., 1892. 24: 313–314.

[3] "Two Weeks Collecting in North Carolina." Ent. News. March, 1893. 4: 80–84.

eurytus (Joh.). Although somewhat outside of the range under consideration we might mention a list of the Butterflies around Nashville, Tenn., by William Osburn.[4] It is worth noting in passing that he includes *Nathalis iole* Bdv., *Anthocharis midea* (Hbn.), *Celtiphaga clyton* (Bdv. & Lec.), *Atlides halesus* (Cram.), and *Atrytone bimacula* (G. & R.).

Life Zones.

The Upper Austral life zone in this region is typified by the rolling, red-clay hills of the Piedmont area of the lower N. E. part of Georgia. This zone stretches as a belt through the state varying from 125–200 miles in breadth, and extends into the central Carolinas on the one side and into Alabama on the other. To the south it is rather sharply set off from the Lower Austral zone (Coastal Plain)[5] by the " fall-line " which extends obliquely through the center of the state (Columbus-Macon-Augusta); whereas to the north it gradually passes over into the Transition zone (mountains) without any sharp demarcation. The Upper Austral zone reaches far into the mountain region along some of the main rivers, and is also found in the great valleys separating the major mountain systems (Cumberland, Smoky, and Blue Ridge Chains).

In its most typical aspect, as around Clarke County, one sees open fields, rolling hills, and dry woods, with occasional rich bottom land or moister woods along the rivers, or rarer still a small swamp or two—in fact such might be called *the typical landscape* of the region. Among the more familiar plants it is characterized by great smilax tangles, honeysuckle (*Lonicera japonica*), black willow (*Salix nigra*), blue beech (*Carpinus caroliniana*), buckeye (*Aesculus octandra*), short leaf and loblolly pine (*Pinus echinata* and *taeda*), etc.

The Transition Life Zone is typified by the mountainous parts of Northern Georgia, South Carolina, North Carolina, and Tennessee, but its upper altitude limit depends considerably upon the latitude under consideration. In Georgia the highest peaks reach slightly over 5,000 feet in elevation, and on their summits the

---

[4] Ent. News. 1895. 6: 245–248, 281–284.

[5] The Lower Austral life zone, typified by the coastal plain, is not considered in this paper. A good idea of its butterfly fauna may be obtained from Harris's State list.

fauna and flora is still that of the Transition Zone, whereas 50 miles further north in the Smoky Mountains the Transition Zone passes over into the Canadian Zone at about 4,000 feet or even less. As is usual in life zone studies we can neither draw a sharp line between Upper Austral and Transition on the one side nor between Transition and Canadian on the other, but the presence of these three life zones in this region is well attested by the fauna and flora. For convenience we may consider a broken line extending N. E. and W. S. W. of Clarkesville (Habersham County, about 10 miles north of Cornelia) as separating the Upper Austral from the Transition Zone in Georgia, with reservations and exceptions as noted above. The discretional use of such a line will serve for the zonal study to follow.

Some of the more familiar characteristic plants include white pine (*P. strobus*), hemlock (*Tsuga canadensis*), rhododendron (*R. maximum*), witch hazel (*Hamamelis virginiana*), etc., and to a less extent mountain laurel (*Kalmia latifolia*), chestnut (*Castanea dentata*), chestnut oak (*Quercus montana*), etc.

The Canadian Life Zone, at its southern extremity, is limited to the high elevations on the crest of the Smoky Mountains (5,700–6,000 feet or more), and extends only a few miles south of Andrew's Bald and Clingman's Dome (almost due west of Bryson City and about 25 miles from the Georgia line). Only a few miles further north, however, it increases greatly and extends down to below 4,000 feet in altitude. Apparently a similar situation occurs in the Blue Ridge chain to the east (with which the author is less familiar), and thus suggests a possible reason as to why certain Canadian forms[6] are found at much lower elevations a few miles north of Bryson City than a few miles south. This zone is best characterized by red spruce (*Picea rubra*) on which these elevation limits are largely based.[7]

It might be of some interest to note at this point that the Cumberland Mountain chain is of a different geological origin from the Smoky and Blue Ridge chains. The former is limestone; the latter are granite, and much older.

---

[6] See under *Polygonia faunus* (Edw.).

[7] For an excellent, popular description of this region see Kephart, H. "Our Southern Highlanders." New York, Macmillan Co. 1922.

Specific Localities and Abbreviations.

To conserve space in the body of the article a standard set of abbreviations has been adopted for the following localities which include all of those intensively collected by the author; odd records are noted under certain species as encountered. Many of the mountain records have been verified as general by observations made while on extensive hiking trips without the exact localities having been recorded in my notes, but all such are the typical forms of the region.

Andrew's Bald = Swain Co., N. C. (Smoky Mountain National Park). Alt. 5950 ft. A large bald spot covered with deep "prairie grass," fringed with golden rod, and bounded by spruce is found at the top. Only five species of butterflies were taken here in three days' stay (Aug. 21–23, 1928),[8] but doubtless others are to be found during different parts of the season. Lower Canadian.

Athens = The principal city in Clarke Co., Ga. Alt. 800 ft. Records from a flower garden near the center of the city.

Bobbin Mill = A splendid ravine S. W. of Athens with a permanent creek which winds a half mile through woods and fields; presenting flat or steep banks of clay or sand, and open or densely tangled surroundings which are bounded by fields, woods, steep bluffs, and waste ridges in all combinations. Offering thus such a variety of habitats, it offers also a correspondingly rich fauna and flora.

Bridle Path = A shady river trail S. E. of Athens. It winds about a mile and a half in length, and is kept open by the cavalry, but nevertheless is shaded throughout, and flanked by a dense undergrowth of shrubs, herbs, and smilax tangles, often extending high overhead. Together these form a canopy beneath which the ground is always moist, yet rarely inundated. It is an excellent collecting ground for shade forms.

Cedar Mt. = In southern North Carolina very near the South Carolina line. Alt. 2700 ft. Transition zone. These records are all by Mr. Townes.

Cemetery = The Oconee Hill Cemetery, in the S. E. part of Athens, is split by the Oconee river, and one especial cove is

---

[8] *Papilio philenor, ajax* (*asterius*), *Colias philodice, Argynnis aphrodite,* and *Polygonia faunus.*

shady, moist and cool. For years this was overgrown, and together with the cemetery vegetation afforded a rich variety of food plants along with a variety of habitats. Several adjoining little hills offer an open sunny habitat quite in contrast to the cool, shady ones close at hand.

Clarke Co. = Used here as an inclusive term to typify this whole central Piedmont area. It includes Bobbin Mill, the Bridle Path, the Cemetery, Forestry Hill, and the Sandy Creek Basin; furnishing among these all the types of habitats found in the Piedmont region. Quite typical Upper Austral Zone.

Forestry Hill = A wooded, hilly area continuous with the Bridle Path. It is covered by a well-mixed, open wood, which is moister than most of the region. It may be considered typical of the better woodlands of the region.

Greenville = Western South Carolina. Alt. 1050 ft. Much like Clarke Co. These records are all by Mr. Townes who has kindly allowed their use here. The list is rather long, and since it closely parallels my own it is quoted here only when of special interest.

Lake Rabun = One of a chain of large, artificial power-lakes about 10 miles N. W. of Tallulah Falls, Rabun Co., Ga. These records are from the woods, meadows, and roadsides around the upper end of Lake Rabun and thence seven miles north to Lake Burton. Like all of the mountain localities the author has collected in it only from early June to early September. Lower Transition.

Monteagle = Near the southern end of the Cumberland plateau about halfway between Chattanooga and Nashville, Tenn. Alt. 2000 ft. The plateau is very narrow, and drops off sharply on either side to the valley floor 1000 ft. below, so that the indigenous fauna, which, like the flora, is probably Lower Transition, is diluted by Upper Austral forms which fly up from the hot valleys on either side, but which probably do not breed on top of the plateau (see under *Dione vanillae*). On account of this habit of some species of flying up from the neighboring valleys one must be very careful in zonal studies of aerial creatures to distinguish between autochthonous species and wanderers. Accordingly I have not included in the typical mountain fauna any form taken here only as adult which I have not taken in pure Transition regions also.

Mt. City = Mountain City, Rabun Co., Ga. Alt. 1900 ft. Three miles north of Clayton in the Rabun Gap valley, and paralleled by mountain ridges reaching an altitude of about 4000 ft. It is in one of the main valleys along which Upper Austral forms stray; occasional specimens of some of which are seen during the hotter spells of summer. The valley is lower Transition, while the surrounding ridges (including Black Rock and Pinnacle Mts.) are upper Transition.

River Falls = In the mountains of Western South Carolina. Alt. 1500–2700 ft. Records by Mr. Townes. Transition zone.

Sandy Creek = The Sandy Creek basin in the northern part of Clarke Co. offers a variety of habitats in the way of open and wooded swamps, temporary bogs and wet bottom lands which periodically are heavily flooded by rains, but which may become thoroughly dry in mid-summer. One portion is a large peat bog basin interlaced by rivulets and well shaded by trees. In many parts the undergrowth is almost impenetrable, but in others, perhaps due to periodic drowning, it is scant. Such localities are not common in the Piedmont area, but represent our closest approach to the great swamps so common in the Lower Austral Zone. While we find certain of the swamp plants more typical of the Lower Austral Zone, for instance the swamp white oak (*Quercus lyrata*), nevertheless the butterfly fauna is typically Upper Austral, as is also that of all the other swamps the author has seen in the Piedmont.

List of Species and Data.

The synonomy used throughout is largely that of Barnes and Benjamin, " List of the Diurnal Lepidoptera of Boreal America north of Mexico " (Bull. S. Cal. Acad. Sci., Jan., 1926. 25: 3–27).

Papilio philenor L. Clarke Co. late March–Sept. common; Monteagle occasional throughout summer; Lake Rabun and Mt. City uncommon; Andrew's Bald one 28–VIII–28. Common throughout the Upper Austral valleys; usually less so in Lower Transition, and only occasionally seen in Upper Transition and Lower Canadian. Occasional specimens from Transition and Canadian Zones have Orchid pollinia (*Habenaria* sp.) attached to the head, eyes and mouthparts. One such specimen illustrating this interesting ecological relationship is figured by Gunder in his "Unnamable Butterflies."[9]

P. ajax L. (=*asterius* Cram.). Clarke Co. and Greenville mid March–Oct. common; Lake Rabun rare individuals in midsummer; Mt. City, July, 1925; Monteagle not uncommon; Andrew's Bald 28–VIII–28. For some reason it is rarely seen in the mountains (local conditions?).

P. cresphontes Cram. Clarke Co. occasional in summer; Monteagle 22–VII–30; Greenville, Sept. —, '28.

P. glaucus L. Clarke Co. early March–Oct. The earliest spring ♀♀ are form *turnus* (yellow ♀); then from about the end of March the typical *glaucus* ♀♀ (black form) are the only type to be found. Lake Rabun and Mt. City throughout summer; Monteagle common. Found throughout all zones except Canadian, and probably will be found there on further collecting.

P. glaucus form ♀ *turnus* L. Clarke Co. March and rarely early April. I have never taken this form in the mountains, but it should be there, in the spring at least.

P. troilus L. Clarke Co. March–Oct., but not nearly as common as the other swallowtails here. Abundant throughout the mountains. While ranging about the same as *philenor* L. it is much more common in the Transition Zone, but much less in the Upper Austral.

P. palamedes Dru. Athens late March–May; Cemetery 20–IV–29. Several seen each year.

P. marcellus Cram. Chapel Hill, N. C., 7–IV–87 (Atkinson); Greenville general and common. The early spring brood in Clarke Co. is better placed with the next.

P. m. form *floridensis* Holl. Clarke Co., especially on the Bridle Path and Forestry Hill from early March–early May, common. It is especially fond of the blossoms of silver bell (*Halesia carolina*).

P. m. form *telamonides* F. & F. Clake Co. rare in late May or early June; a pair *in coitu* near Bobbin Mill 29–V–27.

P. m. gen. aest. *lecontei* R. & J. Clarke Co. and Greenville, not uncommon in midsummer, especially on Forestry Hill.

Ascia monuste (L.). Bridle Path, early August, 1927; Cemetery 17–VI–28. A common Lower Austral form of which stray specimens have been positively identified in Clarke Co. twice.

---

[9] Ent. News, 39: 203. 1928.

A. protodice (Bdv. & Lec.). Clarke Co. June–Aug., but scarce since 1927. Mr. Harris tells me it was common in Northwestern Georgia during Sept., 1930. Greenville common in late summer and fall.

A. rapae (L.). Common throughout the year except for the short cold snaps of mid-winter; Monteagle, Greenville, Rabun Co., etc., common.

A. r. gen. aest. *yreka* (Reak.). The summer form of the above.

Catopsilia sennae eubule (L.). Clarke Co. and Greenville, common, April–early November, and odd specimens later (1 ♂ 13–XII–27); Monteagle, July–Aug.; Rabun Co. at lower elevations June–Aug., rare.

C. philea (John). Stray specimens have been taken at Macon (Sept.) and Augusta (June) by Mr. Harris.

Zerene caesonia (Stoll). Athens 26–IV–27 and 26–X–29. Generally distributed throughout the Upper Austral part of Georgia, but rare.

Z. c. gen. autum. *rosa* (M'Neill). Athens 4–IV–27. A few more of each have been seen from time to time (erroneously given as "rosea" in Harris's state list).

Eurymus eurytheme (Bdv.). Clarke Co. early March–May, very common; Monteagle, April; presumably this is the spring form throughout the mountains also. The ab. ♀ *alba* (*Stkr.*) occurs in the same place and times, but much scarcer than the yellow ♀♀.

E. e. form *amphidusa* (Bdv.). Clarke Co. abundant May–Nov.; Monteagle rather common; uncommon, but persistent throughout the mountain valleys. The ab. ♀ *alba* (Stkr.) is common at the same places and dates.

E. philodice (Godt.). Clarke Co. scarce late March–Nov. Monteagle, July–Aug.; about as common as *eurytheme* in lower Transition, and found commonly, without *eurytheme,* in upper Transition and lower Canadian. The form ♀ *alba* (Stkr.) found once in Clarke Co. 22–VII–29; Monteagle 1–IX–29. Overlooked by Harris in the state list.

Eurema nicippe (Cram.). Clarke Co. early March–late Oct. common; Monteagle June–Sept.; Copper Hill, Tenn. 19–VIII–28 (an Upper Austral valley with a depleted flora and fauna due to sulphur fumes from the copper mines); and occasionally seen in all the large valleys where other Austral forms are also present. Mr. Townes reports it scarce in the lower mountains of western South Carolina. One ♂ very close to ab. *flava* (Stkr.) Clarke Co. 10–VIII–26 [but *flava* (Stkr.) is supposed to be a ♀ form].

E. lisa (Bdv. & Lec.) Clarke Co. late July–Oct. very abundant; Monteagle early Aug.–late Sept.; Copper Hill, Tenn. common in August; Mt. City and Lake Rabun occasional specimens in August. To be seen in all the Austral valleys in the mountains, but not as commonly as further south. Reported by Mead from Mitchell Co., N. C., at 3800 ft. The majority of the ♀♀ from Clarke Co. are intermediate to form ♀ *alba* (Stkr.), well colored yellow specimens being uncommon, but rare individuals are taken much whiter than the types, with a few specimens pure white above and almost so below. It is not as common as the yellow form at Monteagle, and I have never taken it in the mountain valleys.

E. demoditas Hbn. (= *delia* Cram.) Clarke Co., especially the Cemetery, mid-September–early November. The scarcest of our four species. Greenville, Sept.–Oct.

E. jucunda (Bdv. & Lec.) Clarke Co. rare late May–July, common mid July–early September; Greenville scarce in early summer, but common Aug.–Sept.; River Falls common in August; Lake Rabun one in July 1927; Monteagle 31–VIII–29 (stray?). A very light ♀ very close to form ♀ *pallidula* Klots taken in the Cemetery 9–VIII–26 (this form was described from Guatemala and Mexico, and has not yet been reported from U. S. to my knowledge), and several slightly washed ♀♀ of scattered dates are intermediate. The type of the reverse ab., ab. ♀ *fusca* Harris, is from Atlanta 19–X–26 (Naumann).

Rare specimens have been taken at Athens and Greenville which are clearly intermediate between *demoditas* and *jucunda* with a noticeable tendency to occur in the overlapping flight period.

Danaus menippe (Hbn.) Clarke Co. Uncommon late March–April, but quite common late Aug.–Oct. Monteagle a few in late August and September.

Enodia portlandia (Fabr.) Near Monteagle June–Aug. at 1550 ft. alt.; Greenville, Aug.–Sept.

E. p. andromacha (Hbn.) The southern race of *portlandia* (Fabr.). Clarke Co., especially the Bridle Path, but also Sandy Creek, mid April–late Aug., rather common.

E. creola (Skin.) Bridle path early June–early Aug.; one at Sandy Creek in Aug. 1926. One near Atlanta (Mills). Rare.

I have examined the ♂ genitalia of these three forms, and can find no constant morphological differences. Any two slides, even of the same form, will show a number of small differences, but these minute gaps are all bridged over in a series of preparations so that we can account for all differences on a basis of individual variation. The distinctions between the northern and southern races of *portlandia* are slight and intangible, southern specimens being larger and presenting a somewhat different aspect (the value of a separate racial name seems superfluous). *Creola,* however, is separated in the male by the sex-scaling and more triangular fore wing, but I can not separate possible females of this species from large females of *andromacha,* and know no one who can distinguish between them in this sex. I have one ♀ from the Bridle Path 1–VI–29, which may very well be the true ♀ of *creola.* It is larger (58 mm.), and relatively very uniformly colored above and below, with very little of the contrasting light shades and none of the bluish sheen below.

Creola and *andromacha* "play and fight" together on the Bridle Path, preferring the moister parts where the smilax tangles form long avenues; here they dance and dart rapidly up and down the aisles to alight on the tree trunks at any height. I have never seen any in copulation, but from a single "play-group" have taken a series of *andromacha* several times along with a single specimen of *creola.* It is impossible to distinguish between them on the wing, so that it is only after they are killed that one realizes that he is dealing with a mixed population. We have here, then, two forms; separated by a good character in one sex, which living side by side for three seasons under observation showed no visible intergradation.[10] And so we must continue to regard these two as distinct until the question can be satisfactorily settled by breeding experiments. (A set of these specimens, including the doubtful ones, will shortly be deposited in the U. S. N. M.)

---

[10] However one ♂ taken 14–VIII–26 along with a large series of typical *andromacha* shows clearly a considerable reduction of the sex-scaling, but otherwise has the appearance of a typical *creola.* This specimen may represent the first stage of intergradation from *creola* to *andromacha,* but it has not gone far enough to be called a real intermediate.

Neonympha gemma Hbn. Clarke Co., in all shady environs, even in the center of town, but like all the Satyrs commonest on the Bridle Path, late March–Sept. Monteagle, Aug.–Sept.; odd specimens at several points in pure Transition parts of the mountains, and taken at over 3000 ft. in Rabun Co.

Megisto hermes sosybius (Fabr.) Clarke Co., early April–late Sept., common in shady places, Monteagle June–Sept., common; Lake Rabun June, 1927, and higher on the surrounding ridges up to 3000 ft., uncommon. Greenville and River Falls, common.

M. cymela (Cram.) [=*eurytus* (Fabr.)] Clarke Co., early May–Aug.; Monteagle, June–Aug.; Rabun Co., June–July. Not as common in Clarke Co. as either *gemma* or *sosybius,* but far commoner at Monteagle and in Rabun Co.

Satyrodes eurydice (Joh.) [=*canthus* (L.)] ". . . we saw *Neonympha canthus* quite common on the wagon road between Cranberry and Linville" Mitchell Co., N. C. at 3250 ft. (Skinner).

Cercyonis pegala (Fabr.) Forestry Hill June–Aug., rare. Washington Co., Ga., common in certain woods, Aug. 9–12, 1926. Clarke Co. and Greenville specimens tend to be intermediate to *alope* of which *pegala* is better put as the southern race (as in Forbes, W. T. M., "The Lepidoptera of New York and Neighboring States," Cornell Memoir no. 68, 1923, p. 11.).

C. alope (Fabr.) Monteagle, July–Sept. Greenville. This should be found in the Northern Georgia region and the mountains of Carolina, but the author has not seen it there.

Dione vanillae incarnata Riley Clarke Co., July–Nov., common. Monteagle occasional specimens July–Sept., but these are undoubtably strays from the valley below since its food plant, passion flower (*Passiflora incarnata*), does not occur on top of the plateau. Four specimens of ab. *comstocki* Gun. were taken at Athens in October and November during this period. One ♂ much like the type,[11] another ♂ with considerably less black, and the suffused areas quite sharply demarked from the red-brown ground color instead of shading into it; and two ♀♀ in which the fore wings are almost totally melanic above and slightly affected below, but the hind wings quite normal. Many of the individual

---

[11] Ent. News, 36: 5, pl. 1, fig. T. 1925, and Bull. S. Cal. Acad. Sci. 29 (2), pl. 20. 1930.

variants of this species have been bred by Schrader (see Bull. S. Cal. Acad. Sci. as above), and scientific names for this type of specimens are not advisable.[12] Also numerous specimens of ab. *fumosus* Gun. (all ♀♀) have been taken thruout the season. This name applies to those individuals in which the red-brown of the upper surfaces has become a dull, dark brown, and like *comstocki* Gun. should be dropped from scientific nomenclature. A complete set of intergrades can easily be obtained.

Euptoieta claudia (Cram.) Clarke Co., common, July–late August; Monteagle, Aug.–Sept., occasional individuals. I have not seen it in the mountains, but Mead reports it not uncommon at 3800 ft. in Mitchell Co., N. C., and Mr. Townes says it is uncommon in the South Carolina mountains.

Argynnis diana (Cram.) Mt. City, July '26; Lake Rabun, July '27 and '28; base of Brasstown Bald, Ga., Aug. '27; Fannin Co., Ga., common, July and August, 1928 (D. C. Campbell); rather common at one locality near Atlanta (Harris); common on iron weed in the open fields around Cedar Mt. (Townes). At Monteagle ♂♂ were observed as early as June 9, and a pair of fresh specimens were taken *in coitu* 28–VI–30. Around Monteagle they are to be found in shady woods, flying close to the ground in and out among the undergrowth like some giant satyr. When alarmed they rise rapidly high into the air, and disappear among the tree tops. Less commonly they are found in flower gardens, or on some flowering shrub in an open glen near a rivulet. I also observed these same habits around the base of Brasstown Bald, but Mr. Townes has found them commonly in aggregates in the open fields on Cedar Mt. It has a distribution all its own from West Virginia to Arkansas, and is found in both Transition and Upper Austral.

A. cybele (Fabr.) Clarke Co., occasional specimens in late summer and early fall; common throughout the whole mountain region though concentrated about the Transition portions, May–Sept.

A. aphrodite (Fabr.) Cornelia, Ga. (Strohecker); Monteagle June–Sept., less common than *cybele;* Noland Creek at the base of Andrew's Bald, alt. 3750 ft., common 20–24–VIII–28; Andrew's Bald 21–23–VIII–28—the commonest butterfly on the

[12] See Klots, A. B., "On the naming of Individual Variants in Lepidoptera." Ent. News, 41: 298–302, 324–328, 1930.

"bald"; and others taken at various points in upper Transition of Tennessee and North Carolina; River Falls and Cedar Mt. in August. In this region it seems to have about the same limits of distribution as *Polygonia comma* (Harris), though the latter is much less common. An aberrational specimen presumably of this species, but showing characteristics of both *cybele* and *aphrodite* was taken at Tracy City, Tenn. (near Monteagle) some years ago. It has the large size of *cybele,* but the narrow yellow band on the lower surface of the secondaries (is this merely one of the aberrational characters?), the red coloring of the under surface of the primaries, and the general aspect of *aphrodite.* It is now in the collection of Mr. Jeane D. Gunder of Pasadena.

Euphydryas phaeton (Dru.) Two specimens seen at Foster Falls (near Monteagle) 17–VI–30, and several taken at Tracy City in the past. It was "locally common near Mt. Leconte in May 1927" (Ganier). Common at Adairsville, Ga., in May (see Harris's state list).

Phyciodes nycteis (Dbldy. & Hew.) Atlanta and Monroe Co., Ga. (Bradley), "local and scarce."

P. tharos (Dru.) Clarke Co. common throughout summer and early fall; Monteagle common June–Sept.; less common, but persistent throughout all the mountain valleys up to a little over 2000 ft. alt.

P. t. form vern. *marcia* (Edw.) Early spring form found in same localities as typical form. In Clarke Co. late March and April.

P. phaon (Edw.) (= *gorgone* Hbn. partim.) Atlanta (Harris) and Monroe Co., Ga. (Bradley), rare strays.

Polygonia interrogationis (Fabr.) Clarke Co., common in summer, but also occasionally found in the spring (March 12 and April 26, 1927); Monteagle and throughout the mountains at elevations up to 4000 ft. Not reported by either Skinner or Mead.

P. i. form *fabricii* (Edw.) Clarke Co., the dominant form in March and April, but also rarely taken in late summer and fall. Doubtless occurs throughout the mountains in the spring.

P. comma (Harris). Monteagle July and Aug.; Noland Creek at the base of Andrew's Bald, alt. 3750 ft., 20–24–VIII–28. Not reported by either Skinner or Mead. It seems to follow very closely the same southern limits of distribution as *A. aphrodite*

(Fabr.), though I have not taken it quite so far south in N. C.[13]

P. faunus (Edw.) Four on Andrew's Bald 21–23–VIII–28. They, and others seen, were flying in the spruces around the edge of the "Bald." "Abundant along the roadsides from 4000–5000 ft. elevation" around Grandfather Mt., Mitchell Co., N. C. (Mead). Cedar Mt., 24–VII–29. While located on only a few peaks south of Bryson City, others have found this insect at much lower elevations only a few miles further north in correlation with the known distribution of the spruce forests.

Hamadryas antiopa (L.) Clarke Co., often seen in the spring from early March–mid April, but one taken 26–X–29 is the only fall record.

Cynthia atalanta (L.) Clarke Co., late March–early Sept., not common; Greenville, common; Monteagle and the whole Transition zone in general, never abundant, but commoner than in the Austral zone.

C. virginiensis (Dru.) Clarke Co., mid March–Oct., common; Monteagle June and July uncommon; Lake Rabun rare in July; Mt. City rather common July , 1925. Not common in the mountains, and when found generally in the lower valleys, but "reaching the highest crags occasionally" (Mead).

C. cardui (L.) Clarke Co., March–Oct., common '24–'27, but uncommon in the seasons since; Monteagle, June and July, quite uncommon. I have never taken it in the Upper Transition Zone.

Junonia coenia Hbn. Clarke Co., mid March–early Dec., very common everywhere in summer and early fall; Lake Rabun, rare in June and July; Mt. City, one ♂ July '25; Monteagle, Aug.–Sept.; also seen in the lower valleys of Cherokee and Swain Co., N. C. and around Copper Hill, Tenn., and taken at Cedar Mt. and River Falls by Townes. Despite its distribution in the warmer mountain valleys, it does not become a part of the Transition fauna, and never strays above relatively low elevations. In the mountain valleys only odd specimens are seen, whereas in the Piedmont area it is very abundant, and in certain years fairly swarms. It is one of the most characteristic butterflies of the Austral zone.

Basilarchia arthemis astyanax (Fabr.) Clarke Co., especially Sandy Creek and the Cemetery, mid April–Sept., not common; Lake Rabun, rather common, June–Aug.; Mt. City, Monteagle,

---

[13] Both *aphrodite* and *comma* have been taken by Osburn at Nashville (Austral zone) as very rare strays.

River Falls, Greenville and many parts of the mountains, quite common.

B. archippus (Cram.) Clarke Co., mid April–Sept., rather comon, especially along certain roadsides; Cherokee Co., N. C., in a valley with both Austral and Transition forms; Mitchell Co., N. C. at 3800 ft. (Mead). It is much commoner than *astyanax* in Clarke Co., and presumably occurs in both Austral and Transition Zones, though I have never taken it in the latter. Occasional examples of ab. *lanthanis* Cook & Wats. may be found throughout the season.

B. a. floridensis (Stkr.) One ♂ approaching this taken at Athens, 23–VI–29; reported from Nashville, 22–VIII–189—(Osbrun).

Celtiphaga celtis (Bdv. & Lec.) One ♂ near the Cemetery, 4–VIII–26; one very queer ♀ at Athens, 6–VI–29, is unusually large, and has the ocellus between veins M_1 & M_2 very poorly defined above (In U. S. N. M.); Regular at Atlanta (Harris) and Macon (Strohecker); common at Nashville (Harris).

C. c. alicia (Edw.) One at Atlanta (Harris).

C. clyton (Bdv. & Lec.) "Less common than celtis, but apparently having the same range" (Harris).

C. c. flora (Edw.) Stray at Macon in fall '25 (Strohecker).

Anaea andria Scud. One ♂ labeled "Georgia" in Cornell Coll.; a colony found of a dry, rather open hillside near Macon in spring '30 (Strohecker); Monteagle and vicinity, in September; common at Nashville (Osburn). Presumably confined to the Austral Zone.

Libythea bachmanii Kirt. Throughout the Upper Austral, but greatly restricted to the immediate vicinity of its food plant (*Celtis*). April–October.

L. b. form *larvata* Stkr. Three at Sandy Creek early Aug. '26.

Atlides halesus (Cram.) One ♀ U. of Ga. drill field, Athens 15–IV–27; regular at Macon (Strohecker); one ♂ in a dry creek bed near Monteagle at 1500 ft. alt., 5–VII–30; rare at Nashville in August and September (Osburn); Table Rocks, S. C., 2–IX–30 (Townes). This strong flying insect is more typical of the hotter parts of the country, but may stray far away as indicated by my taking one in fair condition at the lower edge of Transition in the mountains of Tennessee.

Strymon cecrops (Fabr.) Clarke Co., common, especially the shady parts of the Cemetery and drier parts of the Bridle Path, late March–Aug.; Lake Rabun, one, 12–VII–27; Greenville, River Falls, and Calahan Mt., S. C. (Townes). Not listed by Osburn.

S. m-album (Bdv. & Lec.) Two at Athens in late spring; near Monteagle at about 1500 ft. throughout July (common 5–VII–30); Chapel Hill, N. C. 6–IV–1887 (Atkinson).

S. melinus Hbn. Clarke Co., late March to September, uncommon; Greenville "common throughout the season."

S. edwardsii (Saund.) Athens, several, June & Aug.; Rabun Co. (Bradley); River Falls, June '29 and Calahan Mt., S. C., 16–VIII–29 (Townes).

S. titus (Fabr.) Atlanta (Harris); Macon (Strohecker); Cedar Mt., "common in June" (Townes).

S. calanus (Hbn.) Clarke Co., 1–VI–29. Mills list from Atlanta.

S. liparops (Bdv. & Lec.) Monteagle, mainly in the dry creek beds on the sides of the plateau, June & July, uncommon.

Mitoura gryneus (Hbn.) (= *damon* Cram.) Several at Athens during 1924–25, but not seen again until one worn specimen was taken 19–IV–29.

M. g. smilacis (Bdv. & Lec.) Stone Mt., Ga., 13–VIII–13 (In Cornell collection), and more recently by Fattig; Nashville rare in June & August (Osburn).

Incisalia niphon (Hbn.) One ♀ in spring at Macon (Strohecker); near Greenville, 9–VII–30.

Feniseca tarquinius (Fabr.) Clarke Co., early April–early Sept., usually only odd captures; Greenville in April; Monteagle, 5 and 9–VII–30. Apparently Austral and Lower Transition in this region.

Lycaena hypophlaeus (Bdv.) A small colony near the Cemetery where odd specimens might be taken in late March and Aug.–Sept.; common at Augusta in '30 (Harris); one at Atlanta (Harris); Greenville, River Falls, and Cedar Mt. (Townes); Lake Rabun June & July. Usually rare.

Brephidium isophthalma (H.–S.) Rare strays at Atlanta (Harris & Mills).

Hemiargus hanno (Stoll.) Rare strays at Atlanta (Harris) and Macon (Strohecker).

Everes comyntas (Godt.) Clarke Co., mid March–Oct.; very common and generally distributed.

Glaucopsyche lygdamus (Dbldy.) The types are from Screven Co., Ga. (Lower Austral), and it extends thence to Canada, but has not been discovered in this region to date.

Lycaenopsis pseudargiolus (Bdv. & Lec.) Bridle Path, Cemetery, and Bobbin Mill, mid March–mid April, quite scarce; Greenville.

L. p. gen. aest. *neglecta* (Edw.) Clarke Co., early May–Sept., commoner than the spring brood, but still scarce; Lake Rabun & Mt. City in July, rare; Monteagle common June–Sept. Relative to *comyntas* it is much commoner in the Transition Zone.

For the identification of the following Hesperiidae I am indebted to Mr. R. C. Williams, Jr., Mr. F. E. Watson, and Dr. W. T. M. Forbes.

Epargyreus tityrus (Fabr.) Common everywhere up to 3000 ft. in the mountains, mid March–Sept. A dwarf at Monteagle.

Goniurus proteus (L.) Clarke Co., common, late July–Oct.; Greenville, rare in the fall.

Achalarus lyciades (Gey.) (= *lycidas* A. & S.) Bobbin Mill late April–June, common on the waste ridges; few other scattered records from other parts; Lake Burton, Ga., 21–V–11 (Bradley); Clayton 18–26–V–11 (Bradley).

Cecropterus cellus (Bdv. & Lec.) River Falls in Aug., and Calahan Mt., S. C. in June (Townes). Macon (Strohecker).

Thorybes pylades (Scud.) Clarke Co., especially Bobbin Mill, late March–July, uncommon; Greenville; common throughout the mountains.

T. daunus (Cram.) (= *bathyllus* A. & S.) Clarke Co., especially near Bobbin Mill, late March–Sept., common; Greenville, common. One near Monteagle, 8–VIII–30.

T. confusus (Bell.) Clarke Co., 14–IV–26 (compared with type by F. E. W.); Macon 11–13–III–15 (Walker).

Urbanus tessellata (Scud.), mid March–Sept., very common.

Pholisora catullus (Febr.) Clarke Co. and Greenville, early April–Sept., common.

P. hayhurstii (Edw.) Athens, May–Aug.; Greenville, April–Aug., very uncommon; Lake Rabun, one in July.

Erynnis icelus (Scud. & Burg.) Lake Rabun, common in July, and like all the species of the genus widely distributed throughout the mountains as the commonest type of roadside butterfly.

E. brizo (Bdv. & Lec.) Atlanta in spring (Harris); Greenville, April–Aug.

E. b. somnus (Lint.) near Bobbin Mill, 28–III–29 (det.: F. E. W.).

E. persius (Scud.) Bobbin Mill, in May & June, uncommon; Lake Rabun and the mountains generally, common in July and August.

E. martialis (Scud.) Clarke Co. and the mountains generally; "a common skipper throughout the state" (Harris).

E juvenalis (Fabr.) Clarke Co., late March–Aug., common; throughout the mountains, June–Aug., common.

E. horatius (Scud. & Burg.) Bobbin Mill, March–June, uncommon; Monteagle, June–Aug., uncommon; general throughout the mountains, but less common than most species.

E. terentius (Scud. & Burg.) Bobbin Mill and waste ridges near the Bridle Path, mid March–June, rare; Lake Rabun, June & July, rather common; Monteagle, 21–VIII–30; Noland Creek, Swain Co., N. C., at about 3000 ft. alt., 25–VIII–29, uncommon. Austral and Transition.

Ancyloxypha numitor (Fabr.) Sandy Creek basin and other boggy grass lands in August and September. Mitchell Co., N. C., in Transition (Skinner).

Copaeodes rayata B. & McD. [= *minima* (Edw.) of B. & Benj.], Clarke Co., usually rare and isolated captures, but 38 specimens taken in one morning on the flowers of bitterweed (*Helenium tenuifolium*) on an open hillside on the University of Georgia campus (12–IX–28), Aug. & Sept.; Greenville.

Hesperia metea Scud. Greenville, 21–IV–30 (Townes).

H. leonardus Harr. Monteagle, common in Aug. & Sept.; River Falls, near Greenville, and at Cedar Mt., Aug. and Sept.

Hylephila phylaeus (Dru.) Clarke Co. and Greenville, Aug.–Nov., common; one ♀ at Athens, 2–XI–27, with twice the usual amount of yellow; Monteagle, uncommon in Aug. and Sept.

Polites verna (Edw.) Clarke Co., (no dates), and Macon (Strohecker).

P. manataaqua (Scud.) Clarke Co., and Greenville, Aug. and Sept., common; Monteagle, common in June (a gynandromorph, 12–VI–30).

P. peckius (Kirby) Greenville, Aug. and Sept.; River Falls, 18–VIII–30, rather common (Townes).

P. vibex brettus (Bdv.) Clarke Co. and Greenville, July–Oct., common.

Atalopedes campestris (Bdv.) Clarke Co. and Greenville, common, Aug.–Oct.; Monteagle July & Aug., uncommon; Lake Rabun & Mt. City, rare, in July.

Catia otho (A. & S.) Mitchell Co., N. C. (upper Transition) (Skinner).

C. o. egeremet (Scud.) Clarke Co., Greenville, River Falls, and Monteagle, June–Aug.

Atrytone logan (Edw.) River Falls, Greenville, Calahan Mt. & Caesar's Head, S. C., from June–Aug. (Townes).

Poanes zabulon (Bdv. & Lec.) Clarke Co., mid April–June and Aug., common; Lake Burton, 21–V–11 (Bradley).

P. yehl (Skin.) Athens two ♀♀, June & Aug., Bridle Path, one ♀, June; rare.

Amblyscirtes vialis (Edw.) Clarke Co., uncommon in July; Greenville, common; Lake Rabun, 15–VII–28.

A. alternata (G. & R.) Rare at Macon (Strohecker).

A. textor (Hbn.) Bobbin Mill, Atlanta (Harris), Macon (Strohecker), River Falls, Calahan Mt. (Townes) and Clayton, Ga. (Bradley), May–July.

Megistias fusca (G. & R.) Clarke Co., rare in July; two at Greensville in Aug.; Noland Creek, Swain Co., N. C., from 2500–3000 ft., 21–24–VIII–28, uncommon.

Lerema accius (A. & S.) Clarke Co., Aug.–Sept., common. These specimens range from typical to almost immaculate, and one taken 8–VIII–27 has almost entirely lost the clear spots .

Oligoria norus (Ploetz) [= *maculata* (Edw.)] several at Macon (Strohecker).

Lerodea eufala (Edw.) Clarke Co. and Greenville, Aug.–Sept., common.

Prenes ocola (Edw.) Clarke Co., Aug. & Sept.; Greenville, Sept.–Nov., rather uncommon. Reported by Osburn for Nashville.

Megathmus yuccae (Bdv. & Lec.) Greenville, April & May, common (Townes).

M. cofaqui (Stkr.) Two ♂ and one ♀ at Macon (Strohecker)

An Attempted Zonal Analysis.

The following is an attempt to give in contrasted lists the faunal differences of the Transition and Upper Austral zones[14] in this region. Any first attempt at such must contain numerous errors, but it is hoped that it will tend to stimulate others who collect in this section to keep notes on this aspect of the subject in order that we may accumulate sufficient data to draw more definite conclusions upon the subject. It is with this hope in mind that the author ventures to present the following.

A number of species, while characteristic of one zone, are nevertheless more or less commonly found in the other also. Such forms are placed in the zonal list of which they are more typical, and the initial of the other zone is then added in parentheses, no attempt being made at the present to distinguish between forms which are habitual strayers and those which form a relatively minor but persistent part of a given faunal zone.

Those species which are normally present in both zones so equally, or so nearly equally, as to make a distinction on present data unsatisfactory or unnatural, have been placed in a separate list (forms found in Upper Austral & Transition.) Quite a number of others, especially skippers, have been omitted from all of the lists because of insufficient data at hand.

The author regrets that he is unable to discuss the more fundamental factors which operate to produce these differences in distribution, but must leave that to someone more familiar with such problems.

---

[14] So little is known of the Canadian zone in this region that it seems best not to include it in this discussion. *Polygonia faunus* seems to be the only form restricted to it, but *Papilio ajax* (*asterius*), *glaucus*, *Eurymus philodice*, and *Argynnis aphrodite* seem certainly a normal breeding element, while eventually a number of others on the list will probably be found to belong to this fauna also.

UPPER AUSTRAL ZONE

Papilio philenor (T)
marcellus
Catopsilia eubule
Zerene caesonia
Eurymus eurytheme (T.)
Eurema nicippe
lisa (T.)
jucunda
demoditas
Enodia creola
andromacha (?)
Cercyonis pegala (?)
Dione vanillae
Euptoieta claudia (T. ?)
Junonia coenia
Celtiphaga sps.
Libythea bachmanii
Strymon m-album (Lower T.)
cecrops (Lower T.)
Goniurus proteus
Thorybes daunus
Copaeodes rayata
Lerema accius
Lerodea eufala
Prenes ocola
Pholisora hayhursti
Hylephila phylaeus
Polites brettus
Atalopedes campestris[15]

TRANSITION ZONE

Papilio troilus (A.)
Eurymus philodice (U. A.)
Enodia portlandia (?)
Cercyonis alope (?)
Argynnis aphrodite
cybele (A.)
Euphydryas phaeton
Polygonia comma
Thorybes pylades
Erynnis icelus

FORMS IN BOTH U. A. & T.

Papilio ajax (*asterius*)
Papilio glaucus
Ascia protodice
rapae
Danaus menippe
Neonympha eurytus
Polygonia interrogationis
Cynthia atalanta (T.)
virginiensis
Basilarchia astyanax
Feniseca tarquinius
Lycaena hypophlaeus (T.)
Everes comyntas
Lycaenopsis pseudargiolus
Epargyreus tityrus
Eryniss sps. except *icelus*[16]

The following forms are typically Lower Austral or Subtropical, but occasionally wander a greater or less distance into the

[15] *Neonympha gemma* and *sosybius* should probably be included in this list although I have found them not uncommon at 3000 ft. in Rabun Co. in pure Transition Zone.

[16] Although these species are found in both zones they are more abundant and form a much greater percentage of the fauna in the Transition than in the Uupper Austral.

Upper Austral zone,[17] and one, at least, may even breed there slightly: *Papilio palamedes, Ascia monuste, Catopsilia philea, Phyciodes phaon, Brephidium isophthalma, Hemiargus hanno, Cecropterus cellus, Thorybes confusus, Amblyscirtes alternata, Oligoria norus,* and *Megathmus cofaqui.* The reader is warned that this is not an attempt to analyze, even partially, the fauna of the Lower Austral zone; it merely includes certain wanderers which persistently reappear in the region under consideration, but which do not "belong" to it.

The author would be pleased to hear from others who have or are intending to collect in this region about any of the questions raised here, or to help in any way possible.

Note

Since this paper was sent to press Mr. Robert W. Montgomery has published a short list entitled "Notes on some Butterflies of Northeastern Georgia" (Ent. News. xlii, 109–111. April, 1931.) based on one summer of collecting about half way between Clarke and Rabun Cos. His records, though much less extensive, agree almost perfectly with those given here. His "*Hesperia centaureae* Ramb." may very well be a female *tessellata,* and his records on *Achalarus lyciades* and *Thorybes pylades* extend the dates of these species to Sept. 7 and Aug. 29 respectively.

---

[17] Several of those listed above under Upper Austral are as common or commoner in the Lower Austral; especially *C. pegala, S. m-album, G. proteus,* and *P. ocola.*

A METHOD OF MOUNTING, PRESERVING AND EXAMINING MICRO-ARTHROPODA.

By J. Arthur Reyniers, Department of Biology, University of Notre Dame, Indiana.

Every biologist wants a method for permanently mounting and preserving minute specimens of Acarina, Crustacea and Insecta so that they can be stored in the museum and still be immediately available for microscopic examination. If this method is at the same time simple, convenient, and inexpensive, then the desideratum seems to have been attained. The writer believes that the method presented in this paper meets all these requiremnts.

The method consists in mounting micro animals or plants, suspended in a preservative fluid, in flattened or square capillaries, and of so attaching these capillaries in a lathe arrangement on a slide that they can be turned in any direction under the lens of the microscope.

The capillaries are made so that they are square and with very thin walls. This requires making the flattened glass tubing from which the capillaries are drawn. For this purpose round glass tubing is flattened, after being heated, between two heated steel blocks, or, in a more simple manner, by bending the tubing around the base of a Bunsen burner. It is well to bear in mind that the thinner the walls of the glass tubing used, the better the capillary tube will be both for vision and for handling. If it is desired to make a preparation that will give especially satisfying results, the better grade of glass tubing, such as may be secured from dealers in microscopic supplies and listed as extra grade, should be secured. The tubing that was used in the preparations that form the basis of this paper had an outside diameter of ⅜″, with a lumen of ¼″.

A piece of tubing about four inches long is held in the flame of a wing top Bunsen burner and rotated between the fingers until it becomes soft. It is then quickly bent around the tube of the burner until it has assumed a U shape. It is again heated in the flame—this time the bottom of the U is held upward in the flame. When the tubing is soft it is bent in the opposite direction around the base of the burner and, holding it again in the flame, it is straightened. This procedure gives a piece of tubing that is flattened on both sides.

The flattened portion of the tubing is held in the wing top, in a low flame, and rotated between the fingers. When it is softened the tube is removed from the flame and the hands quickly drawn apart. This procedure gives a capillary of the desired size. The junction of the flattened capillary with the round glass tubing is flared to a funnel shape. A point is selected on the funnel which will more than admit the insect to be mounted and is nicked with a file. The flattened portion of the capillary tapers toward the center and should be at this point just a bit smaller than the insect to be mounted. The capillary is again nicked with a file and is broken off so that two portions exist: both with a flared end and a flattened stem.

The insect may be mounted either in a preservative fluid or some other fluid depending on the length of time it is to be kept. In either case it is suspended in a comparatively large volume. The funnel shaped end of one of the capillaries is brought next to the insect and a quantity of fluid is allowed to run up into the tube either by suction or capillary attraction. The insect is drawn into the capillary with the fluid and if it happens to be broader than it is thick (as is the case with certain Acharina) it will turn so that it fits into the flattened capillary in such a position that it cannot be readily displaced when the capillary is turned. The insect is allowed to go as far back into the capillary as its walls will permit. A two inch length of the tubing is cut, a bit of the fluid is blown out each end of the small piece leaving the ends free of fluid and leaving the specimen suspended in a column of it. The ends of the capillary are sealed in a bunsen flame so that the ball of molten glass which forms on the end are in line with the shaft of the tube. The specimen is now ready for either examination or storage.

For microscopic study of the capillary, a small lathe like arrangement, shown as Fig. 1 in the diagram, is made of brass and glued to an ordinary glass microscope slide. This lathe consists of two end pieces, one the head and the other the tail stock. A hole is bored through the center of the tail stock and is threaded 60 threads to the inch. The screw made to fit this hole has a knurled head at one end and a seating arrangement at the other. This seating arrangement consists of a tapered hole. The head end of the lathe is made of a piece of brass and bears a clutch device to grasp the flattened capillary. This grasping device is fixed to the end of a spindle which turns in the head piece. Detail of both the head piece and the tail stock is shown in Fig. 1 of the diagram.

In use the apparatus is placed on the stage of a microscope and is held in place by the stage clips. A capillary in which an insect has been mounted is placed in the head end of the apparatus and the grasping jaws closed tightly against it. The tail stock is now screwed up and the free end of the capillary is allowed to center itself in a tapered hole at its end. The round head which is formed by fusion of the glass when the capillary is sealed should act like a bearing when turned. In focussing the microscope, the Abbé condenser is either discarded or the top lens removed so as to give a longer light range. If the specimen is not in a position to be examined favorably the capillary is turned by manipulating the knurled head. If it is desired to examine the insect more closely the ends of the capillary may be broken and the insect expelled into a volume of fluid and after being examined may be resealed in a fresh capillary. Specimens may be mounted for museum purposes on glass plates by fixing the ends of the capillaries with traces of balsam. A whole family of insects of microscopic character may be neatly mounted in this manner. It goes without saying that the capillaries may be made of any size and the lathe arrangement made larger or smaller as the case requires.

Key to Plate XIV.

Fig. 1.—Construction of the lathe mechanism and detail of the tail stock and head.

a .... End piece of brass through which the head turns.

b .... End piece of brass through which a threaded tail stock is screwed.

c .... Glass microscope slide upon which the lathe is mounted.

d .... Capillary containing an insect, in place on the lathe.

Fig. 2.—Showing method of drawing and sealing the capillaries.

A .... Capillary drawn to size and cut so that a cone shaped end is made on each capillary.

B .... Method of sealing the capillary in a flame so that the rounded ends may act as bearings.

Fig. 3.—Showing method of mounting capillaries on slide for museum or storage purposes.

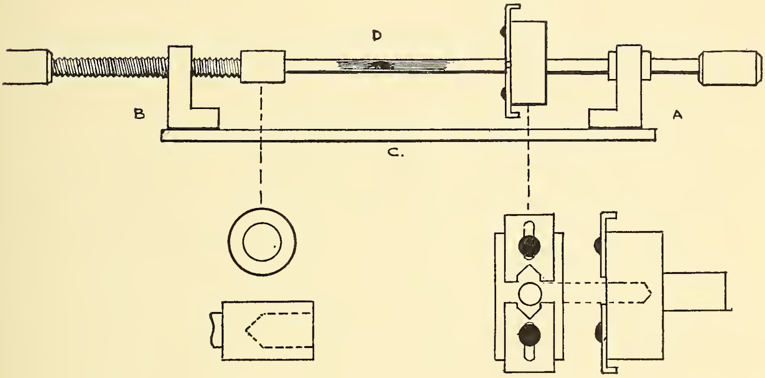


FIG. 1.

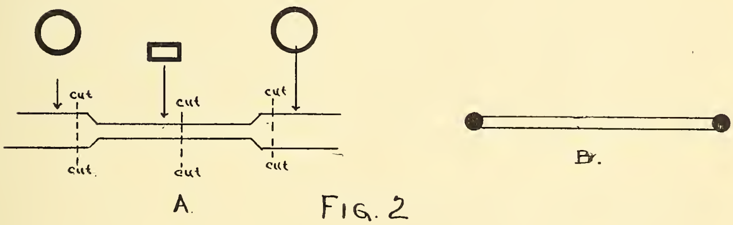


FIG. 2

FIG. 3

BOOK NOTES

A Dictionary of Greek and Latin Combining Forms Used in Zoological Names, by Edmund C. Jaeger. (8 pp. unnumbered, pp. 1–157. Charles C. Thomas, Springfield, Ohio. $1.50).

In these days of multiplication of species entomologists at times find themselves at a loss to invent names not already in the Nomenclator. That is one of the uses of this short word-book, that presents itself at the first glance.

Another use, perhaps the most important, is its aid in understanding the new terminology that is increasing day by day with our greater refinements and greater technical knowledge of insects and other living forms. So much that is new is being worked out that new terms must be coined to cover new concepts. These new words are not in the ordinary non-technical dictionaries; and appear but in very few of the technical ones, certainly not in the English language. In fact, the making of new words keeps well ahead of the appearance of lexicons.

The gradual disappearance of Greek and Latin from the obligatory curricula of high schools and colleges, particularly from the entrance requirements of technical schools, makes such a book as this not only useful but also necessary. Further, some one should publish a Latin grammar and word book for the use of entomologists who have to wrestle with descriptions in elliptic neo-Latin.

Social Behaviour in Insects, by A. D. Imms. (Pp. i–ix + 1–117; figs. 1–20. Lincoln MacVeagh—The Dial Press, New York. $1.50).

This is an excellent brief presentation of the facts amassed and correlated by Wheeler, Forel, Bouvier, Wasmann, etc. It is one of a series of monographs published by the Dial Press.

In its limited pages, Dr. Imms sets forth the complexity of social organization among insects, from its beginnings in the Orthoptera, Dermaptera and others, to its fullest development among the Isoptera and Hymenoptera. While it is impossible to avoid technical terms in such a treatise, those used are carefully defined, so that even those unfamiliar with the subject may readily understand all that is written.

Any entomologist whose sphere does not include these highly specialized forms—a lifetime study in themselves—will find this monograph highly informing and of great interest.

Common Pests, by Rennie W. Doane. [Pp. i–viii + 1–384 (the index pages not numbered), figs. 1–215. Charles C. Thomas, Springfield, Ill. $4.]

This interesting work sets out to give " the essential facts about the more common pests that directly affect man, his domestic animals, his crops . . . and his home. Practical suggestions with regard to control are given." We copy the announcement on the jacket, which, after going over this useful book, we find to reflect accurately its range and its purpose—which is a strange thing in a " blurb," a thing that sets this notice in a class of its own.

Naturally, the work is devoted largely to insects, but there are other pests written about, both invertebrate and vertebrate. The former include not only arthropods, such as mites and spiders, but also parasitic worms. The vertebrate pests injurious in farms and houses include various mice, rats, moles; and some birds. As to these last, their economic disadvantages are offset by their real services to man, except in a very few cases, such as the blue jay.

The Preface says: " Most of the books dealing with these subjects are large and expensive and discuss more or less restricted groups of pests. The government and state bulletins are mines of information regarding the pests with which they deal, but they are not available just when wanted and very few people have sets of these in their reference shelves."

Two general topics are discussed: Pests of man and domestic animals; and insect control and some important pests of the orchard, garden, field and household. Among the pests of man are mentioned the bloodsucking flies, mosquitoes, flesh flies, the common house fly, our sundry commensals and parasitic worms. Insects are discussed under the plants they infest and the methods of insect control are set forth. The two final chapters are respectively on mammals and birds as pests.

Necessarily, in the brief compass of this book it is not possible to go too extensively into any one topic, but the treatment of the subject-matter is adequate and informing. Those who are looking for details will find them elsewhere, in the many official publications on pests. The general aim of Dr. Doane's book is to make it practical and useful as well as informing to the ordinary person. He has succeeded in avoiding diffuseness without sacrificing clarity or sufficiency.

The Fabrician Types of Insects in the Hunterian Collection at Glasgow University—Coleoptera—Part I, by Robert A. Staig. (Pp. 1–xv + 1–110, pls. 1–28. Cambridge University Press; New York, The Macmillan Co. $8.50).

The Cambridge University Press has given us what would seem to be one of the best modern works on the extant types of one of the most industrious of the fathers of entomology. In fact, we may consider Fabricius to be the founder of entomology.

Dr. William Hunter, who established the collection in which these types of insects rest, was Court Physician to Queen Charlotte, consort of George III, a king whose chief claim to American fame is based on his being the immediate cause of our Independence. His consort's physician was a man of learning; and in pursuit of knowledge, he amassed valuable collections—zoological, ethnological and geological, in addition to others more in the nature of art and taste, and to his anatomical preparations. These were all bequeathed to the University of Glasgow, where they are kept, enriched and maintained in the interest and for the use of science. Dr. Hunter's Cabinets of Insects were worked over by Fabricius, who identified and labelled the various species and described many of them as new. It is on these extant specimens, still in a good state of preservation after 150 years, that Mr. Staig has based this first part of his valuable work. In recognizing and controlling the Fabrician species, he has been aided by the British Museum Staff. The twenty-eight beautiful plates are from drawings by Miss Wilson, who has faithfully delineated and colored the specimens *exactly as they are* today. There are also included among the new descriptions, types in this collection of species described by Olivier and others. There are also a number of new synonymies, based on the intensive study of these types. The redescribed species are 55, of which 28 are figured.

The import price (the book is published in England) may seem high, but it is certainly much less than the cost to make a voyage to Scotland to examine these types. The book is beautifully printed and the plates are splendid. As a reference book it is a necessity in every entomological library destined for serious study. It is a work to be placed next to the works of Fabricius, which it complements. Coleopterists will find it indispensable in original work looking to the control and synonymy of species.

For myself, I look forward with pleasant anticipation to the appearance of the volume treating of the Fabrician Hemiptera treasured in the Hunterian Collection.

J. R. T.-B.

EDITORIAL.

OUR BOOK NOTES.

Our Book Notes are not designed to be either extensive reviews or critiques of the works we mention. Their purpose is to draw attention to certain of the current literature which seems to us significant or to be of interest to our readers. Of course, these notes refer in most instances to books rather than to briefer articles or monographs. Those of our readers working in particular groups are well-informed as to their literature; those whose work does not lie in the restricted fields covered by such monographs and articles have no interest in them. Hence, to note them or discuss them would be uncalled for labor. Where such restricted works, however, have a more general application in their technique or implications, they receive mention, as Lindsey on Cynips, where broad evolutionary problems are discussed.

In brief, we note such works as are of general usefulness or of wider purport than their titles or subjects might seem to indicate. Our purpose is to afford our readers a general idea of these works; or of that in them which is of more general interest. To some degree, we evaluate these works as well.

AUTHOR'S EXTRAS.

This is a general reply to sundry of our contributors who have written us from time to time to inquire about the reprints of their articles.

These author's extras are furnished by the Society without charge (up to 25) without any change in pagination, lineation or form. The type is taken bodily from the forms of our journals just as they were printed therein, errors and all. Therefore, they can be employed and referred to with the same confidence as though they were the very pages in our journals. This, of course, deprives us of the subscriptions of those who are able to get the wanted articles from the author (or from a bookseller, under whatever name). (We hope such potential subscribers may read this; and, being enlightened thereby, may become actual subscribers).

Another question is when authors should expect to receive their extras. There is no fixed time for this after the appearance of a paper. The printers of journals, in general, use these reprints as small presses fall idle, to fill in. Hence, there is no schedule for these; and some weeks may elapse after the appearance of a journal before the reprints are received by the author.

We ask our contributors to take what precedes as our answer to queries spoken and unspoken.

THE PURPOSE AND PLAN OF OUR PUBLICATIONS.

It seems well for men from time to time to make a survey of their ends and accomplishments. And here we survey our two publications—The Bulletin and Entomologica Americana.

The Bulletin of the Brooklyn Entomological Society is designed for the shorter papers—for preliminary studies or for the by-product of extensive revisional work; for faunal lists and biological notes. In short, for those things that are elements in a larger picture, but which may well have attention of their own. From its inception, this publication has been dedicated most especially to the insect fauna of the United States, particularly of our own State of New York and that most interesting part of it, the great glacial deposit known as Long Island. We publish on other regions, of course, but always give the preference to studies based on our own local fauna. We also prefer papers between four and eight pages long, but we use others in moderation also. Moreover, we are always willing—nay, most desirous—to publish brief notes from two to ten or fifteen lines long.

Our Bulletin is, of course, preeminently the organ of our Society; and in consequence, it reflects the work and spirit of our members. Our esteemed authors will do well to bear these things in mind when writing for us, even though any good paper is acceptable.

Entomologica Americana, on the other hand, is devoted to the more important monographic work. It is our plan, in general, to publish papers that will fill from forty to eighty pages, one to a number. It has happened that at times we have had to run an article in more than one number, as for instance, Böving and Craighead's *Larvae of Coleoptera,* which fills one entire volume. In this publication we will use anything that promises to be of permanent value, within the limits of length we have set for ourselves. Such articles may be on any phase of the study of insects, from Embryology on.

We are always glad to have the privilege of examining manuscripts that appear to their authors to fulfill the conditions of novelty, importance and permanence.

PROCEEDINGS OF THE SOCIETY.

Meeting of May 14, 1931.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, May 14, 1931, at 8.10 p. m.

President Davis in the chair and thirteen other members present, *viz.,* Messrs. Ballou, Cooper, Eisenhardt, Engelhardt, L. Lacey, Lemmer, Lerch, Moennich, Schaeffer, Shoemaker, Siepmann, Torre-Bueno, Wurster, and Messrs. Pollard and Rummel, and a reporter from the *Brooklyn Eagle.*

Mr. Engelhardt presented the report of the treasurer for the preceding month, showing an income of $111.05, disbursements of $74.51, leaving a balance in the Corn Exchange Bank of $1,143.56. He also reported that the sales of Entomologica Americana were getting along better than had been anticipated, adding that the eleventh volume of this publication is a valuable asset to the society.

Mr. Torre-Bueno, reporting for the publication committee, discussed some of the difficulties encountered in preparing Böving and Craighead's paper for publication, including the difficulty encountered in arranging and properly indenting the keys. Further delay was occasioned by changes that had to be made in the pagination and references, but the volume would be out in four weeks.

Mr. Moennich, reporting for the outing committee, stated that the trip planned for May 2 to Alley Pond Park was not successful, on account of rain. The society extended him the privilege of planning another trip.

Mr. Engelhardt spoke of the excellent collecting in the vicinity of his home at Hartsdale, New York, and expressed his willingness to act as a sort of guide to any of the members who would care to visit him.

Mr. Engelhardt then read a letter from Miss Louise Knobel, Hope, Arkansas, who sold insects at reasonable prices, and commented upon the excellent condition of Miss Knobel's material, much of which was obtained at light traps. He also showed a letter from Charles H. Ingham, 1925 South Hobart Street, Los Angeles, California, who was interested in selling Arizona material, including *Anthocharis pima.*

Mr. Lemmer reported seeing a specimen of *Lycia cognataria* melanic form *swettaria* B. and McD., on May 10 at Lakehurst,

N. J. The specimen had entered his bungalow during the night, attracted to the light. Since the moth was stunned, Mr. Lemmer expected to take it the next morning, but it had revived and flown away. This rare form, which is entirely black in color, was described from Pennsylvania, and is a new record for New Jersey, although there was no specimen to show for it.

Mr. Torre-Bueno spoke on the distribution of some Hemiptera from the Southwest, exhibiting specimens. His paper will be published separately in the BULLETIN. The material was collected by Mr. Engelhardt on his trips to Alpine, Texas; Mississippi, and Royal Palm Park, Florida.

Among the material were several specimens of a rare species of *Platycoris.* Mr. Engelhardt said that he obtained them by digging at the roots of Clematis while searching for *Aegeriidae,* and said that it would not have been difficult to obtain fifty or more specimens of the bug. He added that it was not likely that a collector of Hemiptera would dig around Clematis roots, which would explain the rarity of the species in collections. It was of particular interest to have the record of the particular plant with which the insect was associated.

In connection with his paper, Mr. Torre-Bueno spoke of the difficulty of identifying Hemiptera of many groups, including *Buenoa* and *Mesovelia,* the only literature consisting of isolated descriptions, one author distinguishing his species by some character of the antennae, another by the legs, and so on, so that no definite homologous distinguishing characters can be found. He regretted that so many entomologists described anything that would not fit in which the descriptions as a new species, without any attempt to make a comprehensive study of the genus, and stressed the need of monographs of genera and other groups, providing adequate characters for the definition of genera and the separation of the species within the genus.

Mr. Pollard spoke on *Caligo,* or the owl butterfly, so called because of a large spot on the underside of each wing, resembling the eyes of an owl. Mr. Pollard exhibited several species of the genus, all of which were strikingly similar in their appearance as far as their upper surface was concerned, although the under surface showed more marked differences. All of the species of *Caligo* feed upon banana.

While collecting on Demerara, French Guiana, he had occasion to observe the larvae of a species of *Caligo,* which later proved to be *idomeneus.* In the first instar the larvae are the exact color of the banana leaves, and line up along the midrib, which they closely resemble. After the larvae shed their skin at the end of the first instar, two spots of a rusty reddish color appear on each segment. At the same time the banana leaves begin to be covered with reddish spots of similar size and color, caused by a fungus. The larvae not only change their color after the first molt, but assume a different position. Instead of lining up along the midrib, they group themselves in an irregular mass, so that the spots on the caterpillar completely tone in with the spots on the leaf. After the second instar, the coloration of the mature larva appears. Mr. Pollard remarked that this is the most remarkablbe example of cryptic coloration known to him.

The adults of the owl butterfly live in the forest, and come to the open groves to oviposit, where they can readily be obtained by using banana trees as baits. They fly only between about 5.30 and 5.50 p. m., and alight on the trees with their wings folded vertically in front, so that their color resembles that of the tree trunk.

Mr. Torre-Bueno remarked that probably the reason for the flight of the owl butterfly at that particular time was that at this hour the light in the open groves most resembled the dusk of forest twilight. Mr. Pollard agreed that this might be true, but added that no butterflies were seen flying in the forest, where it was always twilight, during the daytime.

Mr. Lemmer exhibited a clipping from the *Newark Evening News,* of April 6, 1931, regarding Mr. Rummel's caterpillar collecting, which the secretary read, and added to the minutes.

Mr. Cooper produced a clipping from the *American Magazine* of the current month, regarding the entomological adventures of Messrs. Leng and Davis.

Mr. Davis remarked that a brood of seventeen-year locusts was due this year at Wading River, Long Island, and would be seen to their best advantage around June 10.

Mr. Rummel remarked that one could live in a locality for a long time and not be able to capture a common species because one knew nothing about its habits. He had lived at Kearny, N. J., for eight years before he was able to obtain a specimen of *Catocala minuta.* Then he got plenty of them by tying rags around the trunks of honey locust trees, beneath which the caterpillars crawled to pupate.

He also mentioned the remarkable memory and keen sense of direction possessed by some insects, especially Hymenoptera. He once observed a specimen of a butterfly, *Colias eurytheme,* in his backyard, which flew off and away over the housetops, and then found its way back to the identical spot where it had been before.

Mr. Rummel remarked that most species of caterpillars do not feed upon fresh young leaves, or upon the leaves of saplings, but upon older leaves. Mr. Pollard said that he was inclined to agree with him; Mr. Lemmer added that *Catocala,* however, prefers young leaves.

Speaking of the life cycle of Lepidoptera, Mr. Rummel said that the same information does not apply for all localities, and even thirty-five miles may make a difference. To the best of his knowledge no *Sphingidae* or *Saturniidae* were strictly double-brooded, though there sometimes was a partial second brood. *Callosamia promethea* is not double-brooded. He mentioned that a specimen of *Anthocharis genutia* under his observation required three years to complete its life cycle.

The meeting adjourned at 10.30 p. m.

Carl Geo. Siepmann,
Secretary.

Meeting of October 15, 1931

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, October 15, 1931, at 8.15 p. m. President Davis in the chair, and eleven other members present, *viz.,* Messrs. Engelhardt, Lemmer, Lerch, Moennich, Schaeffer, Sever, Sheridan, Siepmann, Torre-Bueno, Wilford, and Wurster, and Messrs. Cleff, Poppel, Schiffer, Slow and Stecher.

The minutes of the previous meeting were read and approved. Mr. Engelhardt reported for the treasurer, showing an income account for the year up to the date of the meeting of $2,087.05, disbursements for the same period of $1,361.68, and a cash balance in the Corn Exchange Bank of $725.37. He added that Böving and Craighead's paper was almost complete, except for the binding and the copyright. Orders for more than two hundred copies above the regular subscription list to Entomologica Americana have already been received, and the society would have no difficulty in financing its publication as the orders come in. Mr. Engelhardt also commented on the low stock of the Glossary of which only thirty copies remain.

Reporting for the Publication Committee, Mr. Torre-Bueno said that the society had much to gain in prestige and reputation by the publication of such an execellent paper as that by Böving and Craighead, which would become the standard work in its particular field. It also would augment the society's stock of publications, which have been providing a constant source of income. Mr. Torre-Bueno explained the reasons for the delay in this volume, which would be out at the end of November, and spoke of the three-way correspondence between the authors, the editor and the printer, necessary before any changes or corrections could be made. The society would not accept subscriptions to ENTOMOLOGICA AMERICANA starting with Böving and Craighead's paper; those desiring that publication would have to pay for it at the society's special rate. The June number of the BULLETIN would be out in a few days, and the October number will follow shortly after.

Mr. Moennich reported for the outing committee. No trip has been planned yet.

Both Mr. Engelhardt and Mr. Davis showed Dr. Blatchley's "My Nature Nook," recently published. It recounts the Doctor's natural history observations from 1913 to 1930 made at his winter home, Dunedin, on the Gulf Coast of Florida. Mr. Engelhardt recalled his visit to Dr. Blatchley, and Mr. Davis read as an example of the entomological observations contained in the book, the Doctor's account of the lubber grasshopper, *Romalea microptera.*

Mr. Schaeffer reported the occurrence of the European *Serica brunnea* on Long Island, five specimens having been collected by Mr. Kenneth W. Cooper at Flushing. This is a new record, not only for Long Island, but for North America as well. Although only five specimens were obtained, Mr. Cooper had said that more specimens could have been collected, indicating that this species is firmly established on our continent. The genus *Serica* is well represented in the United States by native species, all of which are somewhat difficult to distinguish from one another. Among the more outstanding characters, the very pale color, making the specimen appear to be teneral, and the unusually long antennal club of the male, help to distinguish the newly introduced *brunnea.* Mr. Schaeffer said that within the last few years three species of Scarabaeidae—*Popillia japonica, Anomala orientalis,* and *Aserica castanea* have been introduced from Asia, and since become widely distributed and of serious economic importance. He suggested that there is a possibility that *Serica brunnea* may become of equal importance.

Mr. Torre-Bueno said that *Anomala orientalis* was doing considerable damage to lawns in Westchester county, but it did not seem to injure crab grass.

Mr. Engelhardt said that the leaves of his asters had been chewed off by some insect that worked during the night. The insects left the plant during the daytime, but closer examination revealed several specimens of the *Anomala* hiding at the base of the plants.

Mr. Moennich told of his collecting trip to Montauk, Long Island, where he had observed an unusual "swarm" of *Aphodius phaleroides.* His attention had been directed to a conspicuous dark spot contrasting against the white sands, which examination showed to be an accumulation of a large number of specimens of this beetle. They covered an area of about a square foot, and comprised perhaps 500 to 1000 individuals. Mr. Moennich could give no reason for this unusual occurrence of the beetle, but he had noted the species on the wing earlier in the day.

Mr. Wilford spoke of his collecting on Long Island during the preceding summer, and remarked that there were so many "No Trespassing" signs on the Island that there were few desirable places left where on could collect. When he asked an owner for permission to collect on his property, he was refused admission.

The other side of the no-trespassing question was presented by Mr. Torre-Bueno. He said that city residents have no idea of what sort of unprincipled people come out to the country and tear up the shrubbery and flowers. He said that plants were not even safe on the front lawn, and drastic measures are necessary to curb the ravages of such people. Property owners are only doing the logical thing in trying to keep intruders from their grounds, or they would be plundered of all their trees and shrubbery in short order. It was an unfortunate result that entomologists were in this manner excluded from desirable collecting grounds.

Mr. William T. Davis stated that Brood V of the 17-year Cicada had appeared in considerable numbers on the North Shore of Long Island near Wading River during the early summer of 1931. The first mention of this Brood as appearing within the limits of the State of New York, as in the BULLETIN, Brooklyn Entomological Society, October, 1915, under the title, "Long

Island Collecting Notes—The Periodical Cicada from 1910 to 1914." Localities of appearance for six broods on Long Island were indicated on a map exhibited. A more detailed account of the 17-year Cicada on Long Island will appear in a future number of the BULLETIN.

A box of material collected on Long Island in 1914, the last time brood V occurred prior to this year, was exhibited by Mr. Davis in connection with his talk.

Mr. Lerch told of his experiences collecting Membracidae during the past summer.

Mr. Wurster exhibited a freak male *io*. The usual color is canary yellow, with rose markings. This unusual specimen, however, lacked the yellow, a brownish color taking its place, and instead of the rose, there was gray.

Mr. Engelhardt spoke of his collecting trips to the summits of Mt. Marcy and Mt. Mansfield, above the timber line. The latter place in particular is an excellent locality for collecting. Although not so high, it is above the timber line, and the flora is alpine in character. The summit is a long ridge, with plenty of trails, affording a good sized locality for collecting.

The meeting adjourned at 10:20 p. m.

CARL GEORGE SIEPMANN,
Secretary.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

BYRRHIDAE—Wish to exchange local Coleoptera for Byrrhidae of World. Correspondence solicited. K. W. Cooper, 40–40 167th St., Flushing, N. Y.

BUTTERFLY COLLECTORS—Have you butterflies which look different in color or pattern from the average? (See advertisement). Please write. Jeane Gunder, Pasadena, Calif.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

HISTERIDAE—Desire to obtain material, all localities, for identification, by purchase or exchange of other families. Chas. A. Ballou, Jr., 77 Beekman St., New York, N. Y.

CATOPINAE.—American *Catops, Choleva, Ptomaphagus, Catopomorphus, Prionochaeta, Echinocolus, Dissochoetus* wanted by Dr. René Jeannel, 57 rue Cuvier, Paris 5, France.

LOCALITY LABELS.—60c per 1000, 5 in strip, 1 to 3 lines. Good heavy paper. Prompt service. A. L. Stevens, 691 Culver Rd., Rochester, N. Y.

WILL collect all orders of insects about this locality for those interested. Louise Knobel, Hope, Arkansas.

MEMBRACIDAE OF THE WORLD.—Specimens desired from all localities; will purchase, exchange material in other groups, or make determinations for duplicates. Everett C. Lerch, Staten Island Museum, Staten Island, N. Y.

TABLE OF CONTENTS TO VOLUME XXVI.

(Arranged alphabetically throughout.)

Book Notes.

Coleoptera.

Diptera.

GENERAL SUBJECT.

HETEROPTERA.

HOMOPTERA.

Hymenoptera.

Lepidoptera.

Orthoptera.

The Smaller Orders.

INDEX TO GENERA AND SPECIES OF INSECTS, OTHER ANIMALS AND PLANTS.

New forms in **bold face**; valid genera and species in Roman; synonyms in *italics*; * indicates plants; † Long Island Records; ‡ other animals. For list of Coleoptera from British Columbia, see p. 12; for species of *Parnassius*, see pp. 39–44; for extensive list of Connecticut-Rhode Island Lepidoptera and plants, see pp. 57–70; for Texan and Mexican Coccoids and their food-plants, see pp. 189–194; for distributional list of southeastern Lepidoptera, see pp. 234–255. Species named in these articles are not named in the alphabetical index following.

Number of New Genera in this Index, 4.
Species and other forms in this Index, 47.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

Vol. XXVII 1932

EDITED BY

J. R. de la TORRE-BUENO

THE SCIENCE PRESS PRINTING COMPANY
LANCASTER, PA.

Vol. XXVII FEBRUARY, 1932 No. 1

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

BROOKLYN ENTOMOLOGICAL SOCIETY
1872

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
CARL GEO. SIEPMAN GEO. P. ENGELHARDT

Published for the Society by the
Science Press Printing Co.,
Lime and Green Sts., Lancaster, Pa.,

Price, 60 cents Subscription, $2.50 per year

Mailed March 31, 1932

Entered as second-class matter January 21, 1919, at the post office at Lancaster, Pa., under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

CONTENTS

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $2.50 per year; foreign, $2.75 in advance; single copies, 60 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXVII | February, 1932 | No. 1

TERGO-STERNAL MUSCLES IN THE THYSANOPTERA.

By J. Douglas Hood and Sabra J. Hook, University of Rochester, Rochester, N. Y.

In 1909, in describing *Urothrips paradoxus* as a new type of thysanopterous insect for which he erected the new family Urothripidae, Richard S. Bagnall stated that it possessed eleven pairs of stigmata—one on the mesothorax, one on the metathorax, and one on each of the first nine abdominal segments.[1] The insect belonged, however, to the suborder Tubulifera, which had always been considered specialized rather than primitive; and this startling disposition of the spiracles, somewhat suggesting that found in *Japyx* of the primitive order Thysanura, made it necessary to place the Tubulifera first in the thysanopterous series instead of last, and to derive the other suborder—the Terebrantia—from tubuliferous or proto-tubuliferous ancestors. The solution of the several phylogenetic problems entailed by this transposition seemed to be the erection of a third suborder, the Polystigmata. This name was later (Bagnall, '30) replaced by Pseudostigmata, which is hence an outright synonym of the former.

Four years after Bagnall's paper appeared, the late Dr. Philip Trybom described two new species of Urothripidae from Natal and at the same time had before him for study additional specimens of Bagnall's *Urothrips paradoxus.* He says of the seven supernumerary "stigmata," " . . . . it seems to me very doubtful

[1] In making this count, Mr. Bagnall overlooked two pairs of true stigmata—those found on the first and eighth abdominal segments in all Thysanoptera. Had he seen these, his total would have been thirteen pairs, and segments one and eight of the abdomen would have had two pairs each.

that these structures are really stigmata. I have been unable to recognize in these structures any pustules (Jordan) and, if I do not err, they are not situated in the surface of the integument. They are to be seen at least as well on the ventral surface of the body as on the dorsal." (Translation from Trybom, '12, p. 35.)

What these structures really are has never been answered. To the taxonomist they are still organs of unknown function. Dr. C. B. Williams, now entomologist of the Rothamsted Experimental Station, at the time of his visits to America in 1915 and 1919 was much interested in determining their nature; and a hasty survey of the Thysanoptera made at the time by him and Hood showed their presence in all species examined, and that they were not, by any means, structures peculiar to the urothripids.[2]

The authors of this paper began in the fall of 1930 a study of the anatomy and histology of *Hoplothrips major* Hood, partly for the purpose of determining the nature of the organs in question and partly for answers to certain other questions. The abundance in which *H. major* occurs in the vicinity of Rochester, its availability in all stages every day of the year, and its large size, were the factors which determined its selection. *Trichothrips angusticeps* Hood and *Megalothrips spinosus* Hood were also dissected, simply because their abundance brought them to hand in getting new supplies of *H. major.*

After a number of gross dissections had been made, material was killed and fixed in a variety of the standard solutions, and then washed, dehydrated, cleared in xylol, imbedded in paraffin, sectioned, stained, and mounted. Bouin's solution seemed to be more satisfactory for killing and fixing than any other; and in staining, the highly satisfactory results obtained in this work with Delafield's hæmatoxylin were hardly surpassed by the numerous special and more difficult stains which were also employed. Living specimens were perforated before being placed in the killing solution. Little difficulty was experienced in sectioning when the paraffin blocks were oriented so that the microtome knife passed through the softer and less brittle ventral surface first. The harder integument of the notum, however, was frequently broken by the knife. This difficulty could no doubt have been lessened

[2] If I remember correctly, either Williams or myself suggested that these might be muscles. [J. D. H.]

to some degree by using teneral specimens whose integuments would still be soft.

It was noted at once that the paired abdominal structures in question were vertical or dorso-ventral muscles; and they were readily identified as the tergo-sternal muscles—found in most, if not all, insects. At their upper or dorsal ends they are attached to the notum or tergite and at their lower or ventral ends to the sternite of every abdominal segment from the first to the eighth or ninth. The attachment is just laterad of the outermost of the longitudinal tergal and longitudinal sternal muscles (see Plates I–III).

Jordan ('88), Uzel ('95), and Hinds ('02) make little or no mention of muscles, and apparently did not observe the tergo-sternals. Buffa ('98) calls them the "*costrittori dell' addome,*" and on Plate VI, fig. 9, h, pictures those pertaining to the first two abdominal segments of *Heliothrips hæmorrhoidalis.* Priesner ('26) calls them the "*M. transversales abdominis,*" but does not identify them with the structures observed by Bagnall.

Tergo-sternal muscles in insects are expiratory in function, serving to draw the tergum and sternum together, thus compressing the tracheæ and forcing the devitiated air out through the spiracles. They are illustrated and described in most text-books of entomology, including those of Imms ('24) and Folsom ('22).

Representatives of all the superfamilies of Thysanoptera and of nearly every one of the so-called families have been examined in balsam mounts, and the tergo-sternal muscles invariably found in more than five hundred species.

The erection of the Suborder Polystigmata (Bagnall, '12), later replaced by Pseudostigmata (Bagnall, '30), for a certain few species of thrips in which these muscles are perhaps a bit more conspicuous than usual, cannot be justified on the strength of this character alone. The validity of the Polystigmata must be determined on the other differences shown. The subject was discussed by Hood ('30), and it was pointed out at the time that the only important difference between the Polystigmata and the Tubulifera is the distance between the coxæ of the hind pair, this distance being greater than that separating each of the others—certainly a character of less than subordinal value.

Since the publication of that paper, it has been possible to examine the maxillary palpi of *Amphibolothrips.* They are two-segmented, as in all other Tubulifera examined. *Urothrips,* *Bradythrips, Trachythrips, Stephanothrips,* and *Amphibolothrips* —all of the known urothripid genera, save *Bebelothrips* only which we do not know—have, then, *two*-segmented maxillary palpi, not one-segmented as frequently stated by Bagnall.

Accordingly, we place the Suborders Polystigmata and Pseudostigmata as synonyms of the Suborder Tubulifera. The synonymy is as follows:

Suborder *Tubulifera* Haliday.

1836. *Tubulifera* Haliday, Ent. Mag., **3**: 441.
1912. *Polystigmata* Bagnall, Ann. & Mag. Nat. Hist., Ser. 8, **10**: 220.
1930. *Pseudostigmata* Bagnall, Ann. & Mag. Nat. Hist., Ser. 10, **5**: 572.

Bibliography.

Bagnall, Richard S. 1909. "On *Urothrips paradoxus,* a new Type of Thysanopterous Insects." Ann. Mus. Nat. Hungarici, **7**: 125–136; Tab. III.

————. 1911. "Preliminary Notes on the Importance of the new Family Urothripidæ, Bagnall, in the Study of the Thysanoptera." Mem. Ier Congr. Int. d'Ent., 283–288.

————. 1912. "Some Considerations in regard to the Classification of the Order Thysanoptera." Ann. & Mag. Nat. Hist., Ser. 8, **10**: 220–222.

————. 1930. "Further Considerations in regard to the Classification of the Order Thysanoptera." Ann. & Mag. Nat. Hist., Ser. 10, **5**: 571–575.

Buffa, Pietro. 1898. "Contributo allo Studio anatomico della *Heliothrips hæmorrhoidalis* Fabr." Rev. Patol. Veg., **7**: 94–108, 129–142; Tav. V–IX.

Folsom, Justus W. 1922. "Entomology, with special Reference to its Ecological Aspects." P. Blakiston's Son & Co., Philadelphia. (See p. 78.) (1st Edition.)

Hinds, Warren E. 1902. "Contribution to a Monograph of the Insects of the Order Thysanoptera inhabiting North America." Proc. U. S. Nat. Mus., **26**: 79–242; Pls. I–XI.

Hood, J. Douglas. 1915. "An Outline of the Subfamilies and Higher Groups of the Insect Order Thysanoptera. Proc. Biol. Soc. Wash., **28**: 53–60.

————, and **Williams, C. B.** 1927. "A Synopsis of the Thysanopterous Family Urothripidæ." Ann. Ent. Soc. Amer., **20**: 1–8; Pls. I and II.

————. 1930. "Two Urothripidæ (Thysanoptera) from Florida, with Keys to the Known Genera and the North American Species." Bull. Brooklyn Ent. Soc., **24**: 314–322; Pl. 29.

Imms, A. D. 1925. "A General Textbook of Entomology." Methuen & Co., Ltd., London. (See pp. 50 and 51.)

Jordan, Karl. 1888. "Anatomie und Biologie der Physapoda." Zeitschr. f. wiss. Zool., **47**: 541–620; Taf. XXXVI-XXXVIII.

Priesner, Hermann. 1926. "Die Thysanopteren Europas." Fritz Wagner, Wein. (See p. 60.)

Trybom, Filip. 1912. "Physapoden aus Natal und dem Zululande." Ark. f. Zoöl., 7: No. 33: 1–52; Pls. I–V. (See especially page 35.)

Explanation of Plate I.

Hoplothrips major Hood, adult female, horizontal section of abdomen in segments 3 and 4. Photomicrograph of section 25–A6–1 (4 μ), killed and fixed in Bouin's Solution (3–3–½ hrs.), stained with Delafield's hæmatoxylin; × 115.

Œ........Œnocytes.
Nu....... Nucleus of œnocyte cell.
Tr........Trachea.
I.M.......Intersegmental membrane (conjunctiva).
T.–S......Tergo-sternal muscle.
F.B.......Fat body.
P.C.......Primary cuticula ("epidermis," auct.).
S.C.......Secondary cuticula.
Ep........Epidermis ("hypodermis," auct.).

Explanation of Plate II.

Hoplothrips major Hood, adult female, sagittal section of abdomen in segments 4 and 3. Photomicrograph of section 23–d–1 (4 μ), killed and fixed in Picro-sulphuric Acid, stained with Delafield's hæmatoxylin; × 115.

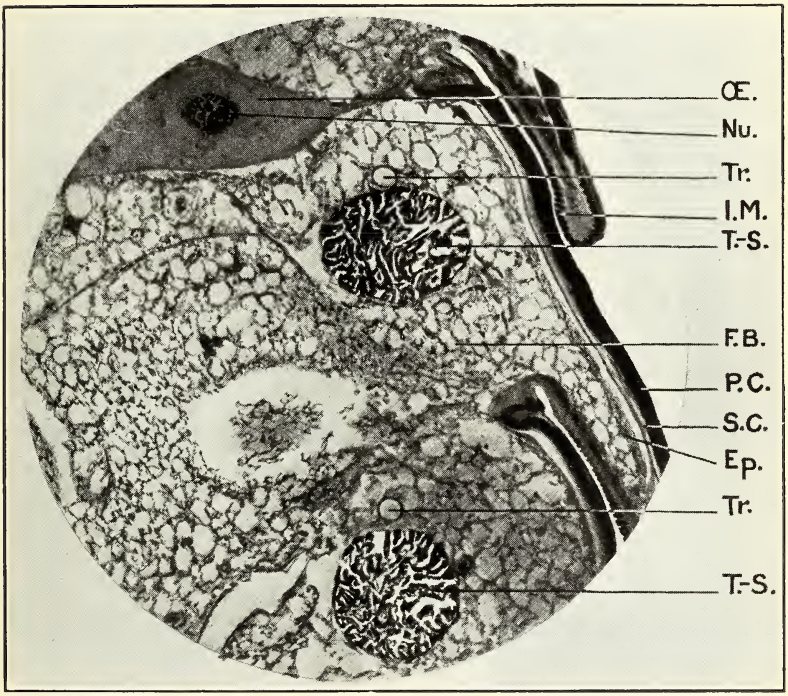
F.B.......Fat body.
Œ........Œnocytes.
Nu....... Nucleus of œnocyte.

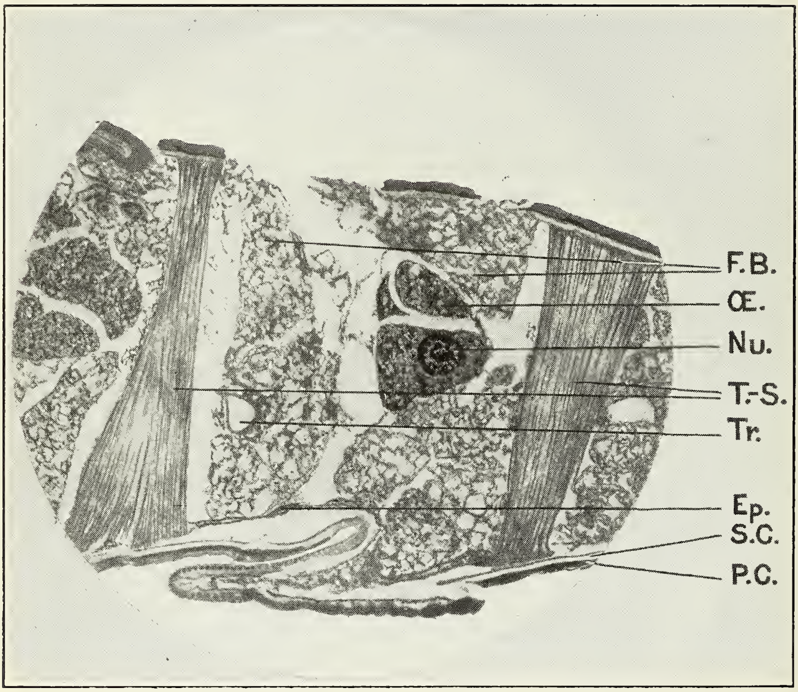
T.–S. . . . . . Tergo-sternal muscles.
Tr. . . . . Trachea.
Ep. . . . . Epidermis ("hypodermis," auct.).
S.C. . . . . . . Secondary cuticula.
P.C. . . . . . . Primary cuticula ("epidermis," auct.).

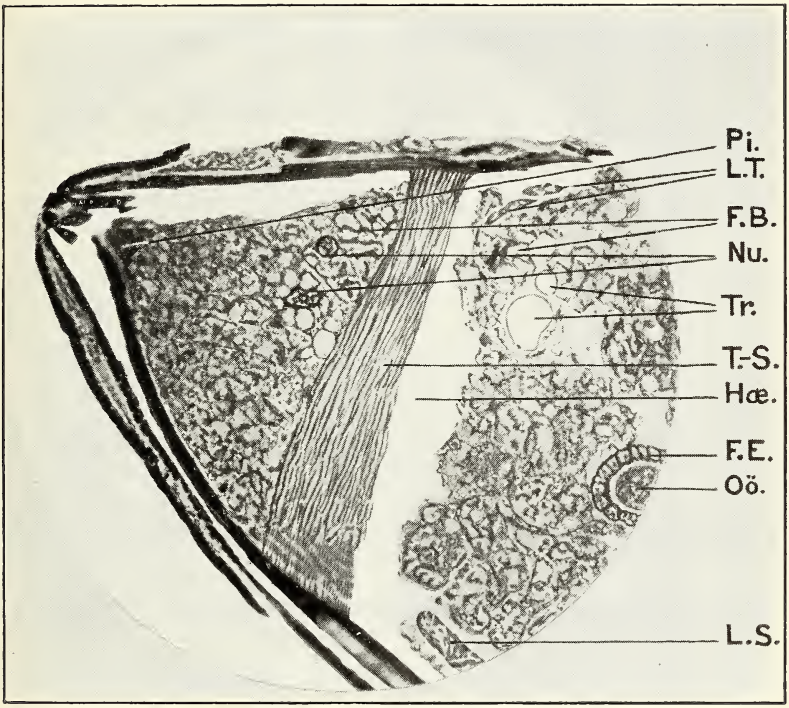
Explanation of Plate III.

Hoplothrips major Hood, adult female, transverse section through abdomen. Photomicrograph of section 25–A10–2 (4 μ), killed and fixed in Bouin's Solution (3–3–½ hrs.), stained with Ehrlich's "Triacid" Mixture; × 115.

Pi. . . . . Pigment (crystals) in fat body.
L.T. . . . . . . Longitudinal tergal muscles.
F.B. . . . . . . Fat body.
Nu. . . . . . . Nuclei in cells of fat body.
Tr. . . . . Tracheæ.
T.–S. . . . . . Tergo-sternal muscles.
Hæ. . . . . . . Hæmocœle.
F.E. . . . . . . Follicular epithelium of ovariole.
Oö. . . . . . . Oöcyte.
L.S. . . . . . . Longitudinal sternal muscles.


Œ.
Nu.
Tr.
I.M.
T.-S.
F.B.
P.C.
S.C.
Ep.
Tr.
T.-S.


F.B.
Œ.
Nu.
T.-S.
Tr.
Ep.
S.C.
P.C.


Pi.
L.T.
F.B.
Nu.
Tr.
T.-S.
Hæ.
F.E.
Oö.
L.S.

THE PARSLEY AND CARROT WEEVIL, LISTRONOTUS LATIUSCULUS BOHEMAN.

By L. L. Buchanan, Bureau of Entomology, Washington, D. C.

For several years past a weevil of the genus *Listronotus* has done considerable damage to cultivated parsley and carrot in the eastern and mid-western United States. Chittenden (1), (2), Chandler (3), and Boyce (4), who have done biological work on the species in Virginia, District of Columbia, Illinois, and New York, use the name *latiusculus* Boheman in published reports, while Harris (5), who has carried on investigations in Iowa, calls the species *rudipennis* Blatchley. Further economic work now in progress makes it desirable to determine the number of species involved, and to fix the correct scientific name or names.

A recent study of about 175 specimens, part of which had been identified as *latiusculus* and part as *rudipennis,* indicates that there is but a single widely distributed species of carrot weevil. Included in the series examined are reared specimens from the sets of Chittenden, Chandler, Harris and Boyce, as well as collected material from many other sources. The North American localities represented are: Manitoba, Ontario, Quebec, Massachusetts, Rhode Island, New York, New Jersey, Pennsylvania, District of Columbia, Virginia, West Virginia, Florida, Louisiana, Ohio, Michigan, Wisconsin, Illinois, Iowa, Missouri, and Kansas. Over this broad territory the species is extremely variable; the features more conspicuously modified are the size, shape, and color of body, the number and distinctness of rostral carinae, the depth of frontal impression, the proportions of funicular segments, the curvature of prothoracic sides, the amount of convexity of elytral intervals, the degree of curvature of tibiae, and the punctation of abdomen.

To some extent, these modifications are connected with colony development; for example, the Harris specimens reared from carrot in Iowa differ in a number of small structural and habital ways from the Boyce examples reared from carrot in New York, while a collected series from Topeka, Kansas averages a little larger and stouter than any of the other sets examined. For the most part, however, the differences seem to be purely individual and merge into one another through numerous intergrading examples. Moreover, the male genitalia remain fundamentally of the same type in all, though, as might be expected, the slender-bodied males have more slender genitalia than do the more robust specimens.

There is no certainty that the carrot weevil is actually *latiusculus* Boheman, as several statements in the original description seem to suggest another species. However, until an examination of Boheman's type proves that our conception of *latiusculus* is based on a misdetermination, the name *latiusculus,* with synonym *rudipennis* Blatchley, can be retained for the carrot weevil. This course, which may be the correct one, has the advantage of agreeing with common usage. In the event of a later change, the name *rudipennis* Blatchley is available.

Past uncertainty regarding the status of *latiusculus* was due, in part, to Professor Weed's statement (6) that he had reared the species from *Sagittaria*; this record raised the question as to why the beetle should have suddenly changed its food preference from a plant of the marsh inhabiting Alismaceae to the botanically far-removed parsley, carrot, and other dry land Umbelliferae-Boyce (4). Professor Weed's original specimen reared from *Sagittaria,* now part of the Illinois Natural History Survey collection, has been loaned to the writer by Dr. Frison; the species proves to be, not *latiusculus,* but one of the forms of the widely distributed and variable *Hyperodes solutus* Boh. It is thus possible to eliminate the confusing *Sagittaria* record from consideration. There is indirect evidence, however, that *latiusculus* is sometimes found in swampy areas, and it is possible, as Mr. J. C. Bridwell has suggested to the writer, that in such situations the weevil utilizes water hemlock or some other of the hydrophytic Umbellifers as a host plant.

Bibliography.

1. **Chittenden,** U. S. D. A. Bul. 82, part 2, 1909, pp. 14–19.
2. **Chittenden,** Bul. Brook. Ent. Soc., vol. 19, 1924, pp. 84–86.
3. **Chandler,** Jour. Eco. Ent., vol. 19, 1926, pp. 490–494.
4. **Boyce,** Jour. Eco. Ent., vol. 20, 1927, pp. 814–821.
5. **Harris,** Jour. Eco. Ent., vol. 19, 1926, pp. 494–496.
6. **Weed,** Bul. Ohio Agr. Exp. Station, vol. 1, art. 2, 1889.

BEES (HYMENOPTERA, APOIDEA) COLLECTED AT CHICHEN ITZÁ, YUCATAN, BY THE HARVARD EXPEDITIONS OF 1929–1930.

By T. D. A. Cockerell, University of Colorado, Boulder, Colo.

The bees listed below were collected in Yucatan, in June, 1929, and February, 1930, during the Expeditions organized by Dr. George C. Shattuck, of the Department of Tropical Medicine of Harvard University Medical School, jointly with the Carnegie Institution of Washington. The expedition was primarily interested in medical problems, and the collecting of insects, not connected with such problems, was merely incidental. The 64 species listed below are therefore only a fragment of the bee fauna of Yucatan, which, so far as I have been able to learn, had never before been investigated. The surprisingly large number of new forms (25) is due, I believe, in large part to the peculiar ecological conditions of the State of Yucatan, which differ not only from those of Mexico proper and Central America, but even from those of the other parts of the Peninsula (the State of Campeche and the Territory of Quintana Róo).

With the exception of a few ranges of low hills, in the extreme southwest, the State of Yucatan is uniformly level and built chiefly of horizontal strata of coral limestone. There is no permanent superficial water, either stagnant or flowing, and the natural water supply is restricted to rain and the deep underground cisterns or wells known in the vernacular as "cenotes." The climate, although tropical, is not very hot and much tempered by sea-breezes, even during the summer. It is extremely dry during the winter and spring, with little or no rain from January till May. The vegetation then gradually comes to rest; the herbaceous plants dry up and most of the bushes and trees drop their leaves. Eventually most of the underbrush is burned by the natives and by April the country presents a most desolate outlook. Toward the middle of May, with the first rains, the vegetation revives, and by June the country is pleasantly green and many of the plants are in full bloom. The rains continue, generally with increasing violence, until December. Over much of Yucatan the original vegetation has been practically wiped out to give way to extensive and monotonous plantations of "henequen" or sisal (*Agave rigida,* or related species). Fortunately, in the vicinity of

Chichen Itzá but little destruction has been wrought. Here the country is covered with dense, but rather low, subxerophytic bush, on the average 30 feet high, with many thorny elements. A few, scattered, larger trees reach 50 to 75 feet. There are many creepers, and epiphytes (especially Bromeliaceae) are fairly numerous in spots. Herbaceous plants, especially grasses and sedges, are very few and Cactaceae also are scarce.

These subxerophytic conditions are on the whole favorable to wild bee life. Most probably the month of June, with its abundance of flowers, was as propitious as any for the study of these insects. I found that the flowers of some of the weeds in the abandoned fields of the Mayas—especially the two Compositae, *Baltimora recta* L. and *Melampodium divaricatum* (L. Rich.), as well as *Boerhaavia erecta* L. and *Ruellia tuberosa* L.—made very profitable collecting. Many of the smaller bees were also attracted by the dense flower racemes of *Acacia Gaumeri* Blake and *Acacia riparioides* (Britt. and Rose). These plants were named from specimens collected by me in Yucatan and sent to Dr. Paul C. Standley, of the U. S. National Museum.

Unless otherwise indicated, all the species listed were obtained at Chichen Itzá, a locality in the southwestern part of the State, well known for its remarkable Maya ruins. The new forms were described by Professor Cockerell in the *Annals and Magazine of Natural History,* (10), VIII, 1931, pp. 413–417 and 537–553, and the types are at the Museum of Comparative Zoölogy of Harvard University.—*J. Bequaert.*

Hylaeus crenulatus (Cockerell).—Three males; two have the face reddened by cyanide.

Hylaeus subgriseus (Cockerell).—One female, at flowers of *Ehretia tinifolia* L. Previously known from a specimen collected at San Rafael, Vera Cruz.

Halictus townsendi Cockerell.—One female. Known from all other Halictines in the collection by the entirely black tegument and the toothed cheeks.

Agapostemon nasutus Smith.—One male. The abdomen has yellow and black bands.

Agapostemon purpureopictus Cockerell.—One female. Known from other Halictines in the collection by the rich but dull purple of thorax above and the entirely black abdomen with white hair-bands. The hind spur has three large spines, the basal one longest, spear-head-shaped, the other two obliquely truncate. The specimen agrees very closely with the description of this species, from Guaymas in Sonora, but is peculiar for the abundant black, or almost black hair on vertex, and the anterior and middle femora red at apex in front, and their tibiæ red in front. It is possible, though I suppose not very probable, that this is the female of the insect described from Guatemala as *A. nasutus gualanicus* Cockerell.

Augochlora (*Augochloropsis*) *chorisis* Vachal.—Two females. A rather small species, with brilliant emerald green abdomen. It is perhaps to be regarded as a subspecies of *A. fervida* Smith, which is common in the United States.

Augochlora (*Augochloropsis*) *gemmicauda* Cockerell (1931, p. 553).—One female.

Augochlora (*Pseudaugochloropsis*) *binghami* Cockerell.—Two males. The antennæ are hooked at the tip. In the female (not in the collection) the abdomen lacks vibrissæ, but the hind spurs are pectinate.

Augochlora (*Odontochlora*) *nigrocyanea* Cockerell.—One female. The specimen is remarkable for its venation, the same on both sides, with the first transverse cubital uniting with the second, diverging below to leave a small triangle so that at first sight it appears that there are only two cubital cells. This is like the condition in the Panurgids *Xerophasma* and *Alloperdita,* but I presume that in *Augochlora* it represents only an individual aberration.

Augochlora (*Odontochlora*) *viridinitens* Cockerell (1931, p. 551).—One female.

Augochlora (*Augochlora*) *cyanaspis* Cockerell (1931, p. 552). —Two females.

Augochlora (*Augochlora*) *urania* Smith.—Two females. A small yellowish-green species.

There are in addition a male and three females (these all different species) of small *Augochlora,* which it does not seem profitable to deal with at the present time.

Calliopsis andreniformis Smith.—One of each sex, taken in copula. It is extremely surprising to find this common United States species in Yucatan.

Euglossa cordata (Linnaeus).—Two females.

Centris nitida subsp. *geminata* Cockerell.—Two females from Chichen Itzá and one from Mérida. This insect was described from Guayaquil, Ecuador. The original *C. nitida* Smith was described from Honduras. It is possible that comparison with Smith's type will show that subsp. *geminata* cannot be maintained; but on the characters assigned, the present specimens are *geminata.*

Centris tarsata Smith.—A small female.

Centris lanipes (Fabricius).—Three females.

Melissodes masuca Cockerell.—Seven females and three males. The females have hair on thorax above bright fox-red, and the males have the nervures very dark, but it seems impossible to separate the species from *M. masuca,* which ranges north to Texas. It has been taken at Victoria, Mexico.

Chalepogenus moestus (Cresson).—Two males and a female. Both sexes at *Tamonea curasavica* Persoon (Verbenaceæ).

Tetrapedia maura Cresson.—Three females; visits *Tamonea curasavica* and superficially looks exactly like *Chalepogenus moestus* (Cresson).

Tetrapedia flavopicta Cockerell (1931, p. 413).—Six females.

Ancylosceles armata (Smith).—Eight females. About half have dark antennæ, with the flagellum dusky reddish beneath, but this is evidently only a variation. These darker specimens can hardly be separated from *A. melanostoma* Cockerell, in the female sex. In the male, *A. melanostoma* has the mandibles and clypeus all black, whereas *A. armata* has a whitish band on clypeus. Those differences may well be racial than specific.

Exomalopsis mellipes Cresson.—One female. A second *Exomalopsis* represents a species I do not recognize, but the condition is unsatisfactory.

Epeolus cameroni Meade-Waldo.—Several females and one male. Described by Cameron as *E. bifasciatus.*

Epeolus bifasciatus subsp. *obscuripes* Cockerell.—Four females and a male. This is a very distinct race of *E. bifasciatus* Cresson (not Cameron), perhaps deserving to rank as a species. The scutellum varies from black to red.

Nomada nitidiceps Cockerell (1931, p. 547).—One female.

Megachile Latreille

The species in the collection may be separated thus:

Males 1

Females 7

1. Transverse keel of sixth tergite denticulate; anterior tarsi yellow and greatly modified ....*poculifera* Cockerell.

Transverse keel of sixth tergite emarginate 2

2. Abdomen with ferruginous or pale orange hair-bands 3
   Abdomen without red or yellow bands 4
3. Anterior tarsi pale ....*veraecrucis* Cockerell.
   Anterior tarsi black .... *squamosa* Friese.
4. Small slender species, hardly 7 mm. long; anterior tarsi simple .... *chichimeca* Cresson.
   Broad and larger species 5
5. Anterior legs red and yellow.
   pollicaris subsp. *pereximia* Cockerell.
   Anterior legs black 6
6. Larger; marginal cell and apex of wing fuliginous.
   frugalis subsp. *atrescens* Cockerell.
   Smaller; marginal cell not fuliginous.
   petulans subsp. *abnegata* Cockerell.
7. Anterior wings strongly flushed with orange, and a blackish subapical cloud; abdomen with reddish hair-bands.
   aurantipennis Cockerell.
   Anterior wings not thus orange 8
8. Abdomen with ferruginous or light orange hair dorsally...9
   Abdomen without red or orange hair dorsally 10
9. Larger and stouter, legs largely red .....*adempta* Cockerell.
   Rather large, legs black ....*acculta* Cockerell.
   Smaller and more slender, legs black .....*squamosa* Friese.
10. Scopa black on last two sternites, otherwise white; red hair below clypeus .... *frugalis* subsp. *atrescens* Cockerell.
    Scopa not black on two sternites 11
11. A conspicuous band of white hair behind scutellum, but none between scutellum and mesothorax; small species.
    chichimeca Cresson.
    A band of white hair between scutellum and mesothorax; mostly larger 12
12. A narrow but very distinct white hair-band behind scutellum; ventral scopa deep ferruginous ..*animosa* Cockerell.
    No band of white hair behind scutellum; scopa paler or white 13
13. Smaller and narrower; clypeus short, with no trace of a smooth line; scopa white, black at tip of last sternite.
    addubitans Cockerell.
    Larger and broader; clypeus longer, with a more or less evident smooth line......*petulans* subsp. *abnegata* Cockerell.

Megachile squamosa Friese (1916).—This is represented by numerous specimens, the majority females. My *M. knabi,* 1919, is exactly the same. When I described *M. knabi* the description of *M. squamosa* had not reached me, owing to the conditions prevailing at that time.

Megachile chichimeca Cresson.—This is the next commonest species in the collection. The male, hitherto unknown, is represented by two specimens. It is slender, parallel-sided, black, with spined anterior coxæ but simple anterior tarsi. Face and front with long creamy white hair, but on under side of cheeks the hair is pure white; antennae long, slender, entirely black, not expanded at end; small joints of tarsi reddish; sixth tergite above rough, practically bare, the transverse keel with two large triangular projections, bounding a deep rounded emargination. In Friese's key of Mexican species this runs next to *M. mexicana* Cress., from which it is easily separated by the essentially bare sixth tergite. Its length is nearly 7 mm. *M. chichimeca* is also related to *M. perpunctata* Ckll., but is smaller, with less black on wings.

Megachile frugalis subsp. *atrescens* Cockerell (1931, p. 537).—One male and one female.

Megachile addubitans Cockerell (1931, p. 537).—One female.

Megachile petulans subsp. *abnegata* Cockerell (1931, p. 538).—One male and three females.

Megachile adempta Cockerell (1931, p. 538).—One female. This species belongs to the group of *M. fossoris* Smith. From that species it is easily distinguished by the ventrtal scopa. The following key separates several similar forms (females).

KEY

1. Thorax above with an admixture of black hairs (Guatemala) *montezuma* Cresson.
   Thorax above without black hairs 2
2. Ventral scopa all pale (Yucatan) ......*adempta* Cockerell.
   Ventral scopa with much black 3
3. Sixth tergite with much erect black hair (Mexico). *azteca* Cresson.
   Sixth tergite with little or no erect black hair 4
4. Scape dark with a little dusky red; abdominal hair-bands broader (Paraguay) .... *leucocentra* Schrottky.
   Scape entirely bright ferruginous; abdominal bands narrower (Mexico) ....*rhodopus* Cockerell.
   M. botanicorum Cockerell is also allied.

Megachile animosa Cockerell (1931, p. 539).—One female.

Megachile acculta Cockerell (1931, p. 540).—One female.

Megachile poculifera Cockerell.—One male.

Megachile veraecrucis Cockerell.—One male. The antennae and tegulae are darker than in the type.

Megachile pollicaris subsp. *pereximia* Cockerell.—One male, similar to var. *a* from Texas.

Megachile aurantipennis Cockerell.—One female. According to Bequaert, this bee is a good mimic of *Pachodynerus nasidens* (Latreille) and other similarly colored Eumenidae, which are common at Chichen Itzá.

Ashmeadiella bequaerti Cockerell (1031, p. 543):—One male.

Heriades carinata var. *purpurascens* Cockerell (1931, p. 543). —Two females.

Hypanthidium yucatanicum Cockerell (1931, p. 544).—One female and one male.

Stelis yucatanica Cockerell (1931, p. 540).—Five females and two males.

Stelis (*Odontostelis*) *abnormis* Friese (1925).—One female (See Cockerell, 1931, p. 541).

Stelis shattucki Cockerell (1931, p. 542).—One male.

Coelioxys Latreille

The species in the collection (females) are separated thus:

1. Scutellum densely and coarsely rugoso-punctate; last sternite broadly rounded at end .... *sanguinicollis* Friese.
   Scutellum smooth and polished in middle 2
2. Margin of scutellum with no median projection. *ardescens* subsp. *yucatanica* Cockerell.
   Margin of scutellum conspicuously dentate or angulate in middle 3
3. Last sternite thickly fringed on each side with black hair. *speculifera* Cockerell.
   Last sternite not fringed with hair; scutellum red. *bequaertiana* Cockerell.

Coelioxys sanguinicollis Friese.—One female. This differs from Friese's description in having the abdominal hair-bands white instead of yellowish. In this respect it resembles *C. tiburonensis* Cockerell, but that differs in other respects, as in the axillar spines, which are red, rather short, and curved in our insect. There is some resemblance to *C. texana* Cresson, but in our species the last sternite has a small but conspicuous pointed apical projection. According to Friese, *C. sanguinicollis* occurs from Paraguay to Orizaba, Mexico. San José de Costa Rica must be considered the type locality.

Coelioxys ardescens subsp. *yucatanica* Cockerell (1931, p. 545).—One female.

Coelioxys speculifera Cockerell (1931, p. 545).—Two females.

Coelioxys bequaertiana Cockerell (1931, p. 548).—Two females.

Xylocopa barbatella Cockerell (1931, p. 417).—Three females.

Xylocopa perviresCens Cockerell (1931, p. 417).—One female.

Ceratina Latreille.

The species in the collection are readily separated thus:

1. Brilliant blue or emerald green species 2
   General color dark 3
2. Tegulae with posterior half clear rufo-fulvous; wings clear. *itzarum* Cockerell.
   Tegulae dark; wings dusky ....*yucatanica* Cockerell.
3. Marginal cell and adjacent parts included in a dark fuscous cloud ....*laticeps* Friese.
   Anterior wings without such a cloud 4
4. Very small, less than 5 mm. long, dark olive green. *nautlana* Cockerell.
   Much larger 5
5. Tergites, except the last, purplish with green margins. *viridicincta* Cockerell.
   Abdomen dark olive green .... *parignara* Cockerell.

Ceratina laticeps Friese.—One male. Previously known from Costa Rica. Friese described it in 1910, and again, as a new species, in 1921, but the two descriptions refer to the same insect. There is a large pallid area in the mesosternal region. This species is related to *C. marginata* Baker.

Ceratina nautlana Cockerell.—One female. Originally described from the State of Vera Cruz.

Ceratina itzarum Cockerell (1931, p. 548).—Three males and three females.

Ceratina yucatanica Cockerell (1931, p. 549).—One female.

Ceratina parignara Cockerell (1931, p. 549).—One male.

Ceratina viridicincta Cockerell (1931, p. 550).—Two females.

APPENDIX

By J. Bequaert

Mr. Herbert F. Schwarz kindly identified the following Meliponidae.

Trigona fulviventris Guérin.—Several workers and males.

Trigona cupira Smith, typical.—Several workers and two males. A nest of this bee was built in the stone wall of a house at Chankom.

Trigona capitata var. *zexmeniae* (Cockerell).—Numerous workers and males from a nest in a hollow trunk of a tree about two feet above the ground. On June 4, many males were observed sitting on the leaves of bushes near the entrance or hovering in the vicinity.

Trigona postica var. *pectoralis* (Dalla Torre).—A few workers. This *Trigona* is sometimes kept in a semi-domesticated state by the Maya Indians, but always in a few isolated hives, quite removed from the large apiaries of *Melipona beecheii* var. *fulvipes.*

Trigona amalthea (Olivier).—A few workers.

Trigona (Nannotrigona) testaceicornis (Lepeletier).—A few workers and one male.

Melipona beecheii var. *fulvipes* Guérin.—Several workers and one male. This is the species of stingless bee most commonly kept in a semi-domesticated state by the Maya Indians. Each hive is a hollow log, plugged at both ends, about two feet long and one-half to one foot across. A tiny entrance hole is bored on one side, generally in the center of a square surmounted by a small cross carved in the wood. Fifty or more of these hives are piled up in rows along slanting sticks placed in roof-fashion, five to eight hives to a row. The whole apiary is protected against the rain and the sun by a roof of thatch.

Bombus medius Cresson.—A few workers visiting the flowers of *Baltimora recta* L. and *Ruellia tuberosa* L., two common weeds in the cornfields of the Maya Indians. According to Dr. Geo. J. Gaumer, of Izamal, this bumblebee nests in old stone walls and in hollow trees. The species has been named by Mr. T. H. Frison and was the only bumblebee observed in Yucatan.

Murgantia histrionica in Mississippi; and Comment on the Incompleteness of Catalogues and Faunal Lists—Dr. Clay Lyle, of the State Plant Board of Mississippi, writes me that he was surprised to see my statement on p. 138, vol. xxvi of this BULLETIN, that my record of *Murgantia histrionica* from Biloxi was a new State record for this species. He refers me to Farmers Bulletin 1061, U. S. Department of Agriculture, in which Dr. Chittenden gives a distributional map which shows the species to be found in Mississippi. Dr. Lyle also tells me that the species is reported in practically every issue of the Insect Pest Survey of the Bureau of Entomology, especially in the late summer and fall, when the bug is most abundant.

Of course, my own attitude as to the purported distribution of Heteroptera in general, is most skeptical; many of the records to which I have referred have been according to the information available from the most recent catalogues or lists and accessible to me. Now, Government publications are not ordinarily sent to private students, except as an act of grace; officials of all kinds, however, get them whether they need them or not, quite automatically.

Hence, distributional oversights are bound to occur in the output of a private worker who must rely on catalogues—catalogues which, from the very flowing nature of the science can never be complete and up to the moment, and which are in fact obsolescent from the very instant they go to press.

So, I find I must correct an entirely involuntary error, which arose from my unfamiliarity with official publications.

However, on p. 139 of the same issue, I draw particular attention to the oddity that so well-known a bug as *Murgantia* should seem to be absent in Mississippi. My reluctance to accept this absence as an established fact was, as Dr. Lyle's letter shows, abundantly justified.

Nevertheless, the nonofficial private student of entomology will always be in peril of these omissions, from the nature and restricted circulation of official publications. I shall be at particular pains to make this evident in such distributional papers as I may publish in the future.—J. R. DE LA TORRE BUENO.

A PHYLOGENETIC STUDY OF THE HEAD CAPSULE IN CERTAIN ORTHOPTEROID, PSOCOID, HEMIPTEROID AND HOLOMETABOLOUS INSECTS.

By G. C. Crampton, Ph.D., Massachusetts State College, Amherst, Mass.

In the following discussion, I would present the evidence furnished by a study of the head capsule for determining the interrelationships of the insectan orders and their proper positions in the general phylogenetic scheme, as additional evidence supplementing and augmenting that already made available for the purpose by previous studies of such features as the terminal abdominal structures, the basal abdominal and posterior thoracic sclerites, the neck and prothoracic sclerites, the maxillae, etc., which have been compared throughout the orders of insects from the standpoint of phylogeny (see Crampton, 1931, 1929, 1926, 1923, etc.).

It is very difficult to determine whether the prognathous or the hypognathous type of head capsule is the original one for insects in general (and for the Orthopteroid insects in particular) since both types occur in the lower Pterygota and Apterygota, and in their arthropodan precursors, as was discussed in a paper published in Vol. 60, pages 129 and 284 of the *Canadian Entomologist* for June and December, 1928. In this paper, it was shown that the prognathous type of head occurs in such primitive Pterygota as the naiads ("larvae") of the Ephemerid *Ameletus* (*l. c.,* Fig. 6) and the Odonatan *Gomphus* (*l. c.,* Fig. 14), and in such primitive Apterygota as *Lepisma* (*l. c.,* Fig. 15); and the prognathous type of head capsule also occurs in such "Myriopods" as *Scolopendra* (*l. c.,* Fig. 17) and "*Scutigera*" (*l. c.,* Fig. 26), etc., as well as in such Crustacea as *Asellus* (*l. c.,* Fig. 29), etc., which are very like the ancestors of insects in many respects. On the other hand, the hypognathous type of head capsule occurs in such Ephemerid naiads as that of *Blasturus* (*l. c.,* Fig. 7) which, with certain Odonata, is very suggestive of the immediate precursors of the Orthopteroid insects; and the hypognathous type of head occurs in the primitive Apterygotan insect *Machilis* (*l. c.,* Fig. 8), and is typical of many Crustacea such as *Apseudes* (*l. c.*, Fig. 50), *Mysis* (*l. c.*, Fig. 52) and other forms related to the ancestors of insects. Furthermore, both prognathous and hypognathous heads occur in the primitive Orthopteroid insects, and both types apparently occurred at a very early stage in the development of these insects, so that it is impossible definitely to decide which was the original type, although some entomologists consider that the hypognathous type is the more primitive one.

The Lepismatids represent as closely as any living forms, the precursors of winged insects, and, as is shown in Fig. 15, of the above cited paper, the Lepismatids have prognathous heads with the bases of the antennae thrown far forward near the posterior region of the clypeus, the forward, or " downward " migration of the antennae being apparently associated with prognathism in insects.

Immature Ephemerids and Odonata represent as closely as any living forms, the Palaeodictyopteroid precursors of the Orthopteroid insects, and the hypognathous head of the " larval " Ephemerid *Blasturus* shown in Fig. 7 of the above cited paper, is very suggestive of the precursor of the " mesocephalous " type of head capsule exhibited by the Mantid *Eremiaphila* (Fig. 21 of the present paper), since the contour of both heads is quite similar, and in both the labrum and clypeus (which is not distinctly divided into an anteclypeus and postclypeus) are well developed, while the eyes are borne laterally, the three ocelli form a triangle with the apex directed forward (or downward), and the antennae are located midway down the head (*i. e.*, in the " mesoceratous " position).

The Synarmogogoptera[1] (containing the single fossil insect *Synarmogoge*) which serve to connect the Palaeodictyopteroids with the Orthopteroid insects, are known only from a single wing, so that it is impossible to determine what the heads of the immediate precursoors of the Orthopteroid insects were like; but,

[1] Handlirsch uses designations ending in " -oidea " in characterizing the groups to which these, and the other fossil forms here mentioned, belong; but the ending " oidea " indicates groups of superfamily rank alone, so that designations ending in " -ptera " have been substituted for Handlirsch's groups, which have been adequately characterized by him, and it is therefore unnecessary to characterize them further here—in other words, the ordinal names here suggested are not merely " nomina nuda."

among the insects comprising the superorder *Panisoptera* (*i. e.*, the Protoblattids, Blattids, Mantids and Isoptera) which represents, as nearly as any, the common Orthopteroid stem from which the rest of the Orthopteroids were derived, the head of the Mantid *Eremiaphila* (Fig. 21) mentioned above, is the most like the head of the immature Ephemerid *Blasturus* (which is suggestive of a primitive Orthopteroid form), and suggests the origin of the head types met with in the rest of the Orthopteroid insects.

Within the superorder Panisoptera, the Blattids and Mantids are grouped together to form the order Dictyoptera, while the termites are placed in a separate order Isoptera, but in some respects the Isoptera are more like the Blattids than the Mantids are (*e. g.*, the wings, ovipositor, etc., of the termite *Mastotermes* are extremely " Blattoid ") and the head of the termite shown in Fig. 5 resembles that of the Blattid shown in Fig. 7 (or even the Blattid shown in Fig. 14) more closely than does the head of any Mantid I have seen, while the typical Mantid trends seem to lead to the formation of a more triangular type of head capsule (*e. g.*, the one shown in Fig. 42). On the other hand, the heads of both Mantids and Blattids are typically " opisthognathous " (mouthparts directed backward), while the heads of the termites are more hypognathous or prognathous, and are therefore not so Blattoid as the Mantid heads are, in this respect; and when more is known of the various types of Mantid heads, it is probable that some of these will be found to approach the Blattid type more closely than the termites do.

The Blattids (Figs. 14, 7, etc.) furnish the intermediate types approached by the Isoptera (Figs. 1, 5, etc.) on the one side, and by the Mantids (Fig. 21) on the other, so that one might be led to suppose that the Blattids represent the original type of head capsule from which the others were developed; but, as was mentioned above, it seems more probable that the Blasturoid head capsule of the Mantid *Eremiaphila* (Fig. 21) represents the original one for the Panisoptera in general, and the Isopteroid, Blattoid, etc., types were apparently derived from such a form (as is naturally also the case with the triangular Mantid-type shown in Fig. 42), The Blattids tended to preserve the intermediately placed antennae (" mesoceratous " position) and developed larger reniform eyes (Fig. 7), with modifications leading to the type exhibited by the Blattid shown in Fig. 26 (with holoptic, or contiguous eyes, and " anaceratous," or dorsad antennae) on the one hand, and on the other hand leading to the modification shown in Fig. 14, in which the eyes are reduced to the Dermapteroid (Figs. 15 and 17) type, and the antennae occupy a slightly more ventral position; while the Isoptera tend to develop a more " exophthalmous " or protuberant type of eyes (Figs. 1 and 5), with the antennae markedly " kataceratous " or thrown downward near the bases of the mandibles; and the Mantids (Fig. 42) tend to develop a triangular type of head, with rather large laterally placed eyes, and with the antennae " mesoceratous," or borne halfway down the head.

The superorder Panorthoptera comprises the Protorthoptera, Grylloblattids, saltatorial Orthoptera and Phasmids, with which the Dermaptera should possibly be included, although their position is still undecided. The Grylloblattids are among the most primitive representatives of the superorder (although the Dermaptera have likewise retained many primitive features) and the question of their closest affinities is still much disputed (see discussion in the *Journal* of the New York Ent. Society for 1932), although it seems to me that the Gryllobattids are evidently members of the order Orthoptera in the restricted sense (*i. e.*, the Saltatoria or Euorthoptera and Grylloblattids called Notoptera or Archorthoptera). The Grylloblattid head shown in Fig. 19 is pyriform, with Dermapteroid eyes and " kataceratous " antennae (located far downward or forward near the bases of the mandibles), and was characterized as Forficuloid or Dermapteroid by Crampton, 1926, to emphasize its resemblance to the head of such a Dermapteron as *Anisolabis* (Fig. 17). The characterization "Dermapteroid" for a Grylloblattid head (Fig. 19), however, is not a very appropriate one, since the earwig heads shown in Figs. 12 and 15 are also " Dermapteroid," although they are not of the Grylloblattoid type, and, while the head of a Grylloblattid (Fig. 19) is in a sense " Forficuloid " (Fig. 17) it is much more like that of the Orthoptera shown in Figs. 20 and 22, so that it is preferable to refer to the head of *Grylloblatta* (Fig. 19) as Gryllotalpoid (Fig. 20), or to call the heads of the Orthoptera shown in Figs. 20 and 22 " Grylloblattoid " to indicate that the Grylloblattid, Gryllotalpid and Stenopelmatid heads resemble each other more than they do the heads of any other insects. The Grylloblattid head (Fig. 19) may possibly be traced back ultimately to some Blattoid prototype such as that shown in Fig. 14 (and the similar Forficuloid type shown in Fig. 17 would then be traced back to the same source), or the Grylloblattoid type might have been derived more directly from prototypes like the Isoptera (Fig. 5), and it is even possible that the primitive Mantid type shown in Fig. 21 may represent the ultimate origin of all of these types (although the Mantids themselves did not give rise to the lines of descent of these other forms). At any rate, the Grylloblattoid type arose from some type (probably Isopteroid) within the superorder Panisoptera, and it leads more or less directly to the Orthopteroid types shown in Figs. 20 and 22 (the Stenopelmatids being their nearest relatives within the order Orthoptera).

The saltatorial Orthoptera present a varied aggregation of types which are difficult to trace to a single ultimate prototype, unless the Eremiaphiloid type shown in Fig. 21 represents the original one for the group (but this of course does not mean that the Mantids were their actual ancestors, since the Mantids of the *Eremiaphila* type have merely retained a number of ancestral features from the common Orthopteroid stem). The Gryllotalpid (Fig. 20) and *Stenopelmatus* (Fig. 22) types appear to lead back more directly to Grylloblattoid prototypes (Fig. 19). while the triangular Gryllid head shown in Fig. 25 might readily be derived from the Mantid type shown in Fig. 42 (which in turn leads back to the Mantid type shown in Fig. 21) but it also has much in common with the Blattid head shown in Fig. 14 and with the termite heads shown in Figs. 1 and 5. The suggestion was made by Crampton, 1926, that such Gryllid heads as the one shown in Fig. 36 might be derived from an Isopteran prototype (Fig. 37), and such Gryllid types as those shown in Figs. 3 and 4 (in which the clypeal region *c* is greatly developed) could readily be derived from an Isopteran type such as that shown in Fig. 5, exhibiting a marked tendency toward the formation of a tumid clypeal region *pc* which " bulges up " and encroaches upon the frontal region *f* behind it, in a fashion suggesting the origin of a similar tendency in these Gryllids (Figs. 3 and 4). On the other hand, the Blattid shown in Fig. 9 exhibits this tendency (for the clypeal region *pc* to become tumid and to encroach upon the frontal region behind it) even more strongly than the termites do, and some Blattids such as the one shown in Fig. 14 adumbrate the Gryllid type quite markedly (compare Figs. 4, etc.), so that it is difficult to decide whether the Blattid or the Isopteran type of head capsule would best serve as the prototype for the Gryllid head capsules. The matter is further complicated by the fact that the more immediate ancestors of the Gryllids are represented by the Stenopelmatids (and Gryllacrids), and the direct precursor of the Gryllid type (Fig. 4, etc.) is represented by the Stenopelmatid head shown in Fig. 22, which in turn, leads back to the Grylloblattoid type shown in Fig. 19, so that the question resolves itself into one of determining the ultimate precursors of the Grylloblattid type (which may lead back to a Dermapteran, Isopteran or Blattid-Mantid type, although the Isopteran type furnishes the most satisfactory prototype of the three).

I had hoped that a comparison of a Tridactylid head (Fig. 43) with that of a Tettigid (Fig. 40) might throw some light on the origin of the Acridoidea, since the terminal structures of the Tridactylids are extremely similar to those of the Acridoid family Tettigidae, while the rest of the body of a Tridactylid is Grylloid in many respects, so that the Tridactylids are in a sense intermediate between the Acridoidea and Grylloidea, and should give some indication of the origin of the Acridoidea from Grylloid precursors, if the Acridoidea are to be derived from this source. The head of a typical Tridactylid (Fig. 43), however, does not bear a marked resemblance to the Acridoid type shown in Fig. 40, and in fact the Tridactylid type shown in Fig. 43 is apparently much nearer the Gryllid type shown in Fig. 36, or even the Gryllotalpoid type shown in Fig. 20 or the Stenopelmatid type shown in Fig. 22 (compare the sclerites *ci* in Figs. 43 and 20, or the kataceratous position of the antennae, etc., in the two figures), thus bearing out the contention that the Tridactylids are closer to the Grylloids than they are to the Acridoidea, and it is therefore necessary to seek elsewhere for the precursors of the Acridoidea. The Gryllacrids (which merge with the Stenopelmatids) are apparently the forms leading to the Tettigoniidae, and the Tettigoniid type of head capsule furnishes the best prototype from which that of a typical Acridoidean insect could be derived. Thus, for example, in the (Acridoidean) Tettigid shown in Fig. 40, the eyes *e* are dorsally located and the antennae are anaceratous (or are located more dorsally), both of which tendencies are characteristic of the Tettigoniids, such as the one shown in Fig. 27, which has the eyes located high up on the head capsule, and the antennae are "ultra" dorsal (hyperceratous), so that the Tettigoniidae (which are more primitive than the Acridoidea) are the forms which serve to connect the Acridoidea with the Gryllacrids (and Stenopelmatids) from the evidence of the head capsule, and since the wings bear this out also, it is more probable that the Acridoidea were descended from forms like the Tettigoniidae, which lead back to the Gryllacrids and Stenopelmatids, from which the Gryllids were descended, and all of these lead back to forms like the Grylloblattidae. The Grylloblattids ultimately lead back to forms like the Isoptera and the Blattid-Mantid order (Dictyoptera), which are the nearest living representatives of the common Orthopteroid stem (Protoblattids and Protorthoptera) from which the Orthopteroids in general were descended.

The Phasmids are the next of kin to the Orthoptera (in the restricted sense), within the superorder Panorthoptera, and the Phasmids also exhibit many features in common with the Dermapteran members of this superorder. The most primitive Phasmid head that I have been able to find is that of *Timema* shown in Fig. 18, in which the development of the postorbital or postocular region of the head is not carried to the extreme that it is in the Phasmid head shown in Fig. 34 (which is more typical of the Phasmids in general). In the Phasmid *Timema* (Fig. 18) the eyes are Dermapteroid (Fig. 17) or Isopteroid (Fig. 1) and the antennae are kataceratous (*i. e.*, are located near the bases of the mandibles) as is also the case in the Dermaptera (Fig. 17), Isoptera (Fig. 1), Grylloblattids (Fig. 19) and other forms descended from Isoptera-like ancestors in the common Orthopteroid stem. The Blattid shown in Fig. 14 approaches this type of head in some respects, and the Mantid shown in Fig. 21 may have preserved the original type from which all of these were ultimately derived. On the other hand, such Phasmids as the one shown in Fig. 34 exhibit certain tendencies suggestive of a relationship to the Embiids shown in Figs. 33, 29, etc., which likewise have the postocular region of the head markedly developed, and also have the eyes and antennae located far down toward the bases of the mandibles. The complicated interrelationships indicated by these resemblances may perhaps be explained by the fact that all of the insects under discussion were derived from Isoptera-like forebears in the common Orthopteroid stem, and whatever features they have in common were inherited from this common ancestry. The evidence of the head capsule thus bears out that from other features of the body indicating that the usual method of representing the lines of descent of the Orthopteroid orders by means of a figure drawn in one plane is wholly inadequate for giving a true concept of the complicated interrelationships of these insects, which should be illustrated by a three-dimensional figure having a more " bush-like " than " tree-like " branching, to bring out the fact that the lines of descent are interrelated in an extremely complicated fashion.

A typical Dermapteran head, such as the one shown in Fig. 17, is pyriform in outline, with the eyes rather small and the antennae markedly kataceratous. It may have been derived from an Isopteroid type such as the one shown in Fig. 1, or from a Blattid type such as the one shown in Fig. 14, both of which apparently arose from a type like that of the Mantid shown in Fig. 21. The typical Dermapteran head shown in Fig. 17 is strikingly similar to that of the Orthopteran *Grylloblatta,* shown in Fig. 19, and is also very like the Orthopteran types shown in Figs. 20 and 22. It has much in common with the Phasmid type shown in Fig. 18, while the Dermapteran type shown in Fig. 32 is more like the Phasmid shown in Fig. 34. There is a strong resemblance between the Dermapteran head shown in Fig. 32 and the Embiid types shown in Figs. 29 and 33, and the Dermapteran type shown in Fig. 15 is strikingly like the immature Plecopteran *Perla* shown in Fig. 13. The lines of descent of all of these insects are extremely closely interrelated and all apparently lead back to Isoptera-like forebears in the common Orthopteroid stem (*i. e.,* the common Protorthopteran-Protoblattid forms from which all the Orthopteroid insects were descended). The principal modifications exhibited by the Dermapteran head capsules are illustrated in Figs. 32, 17, 15 and 12, and the forms they approach among the higher insects will be described under the discussion of these higher forms.

The superorder Panplecoptera includes the Hadentomoptera (represented by the fossil insect *Hadentomum*), the Plecoptera, Embiids, etc. Most American and European entomologists group the Plecoptera with the Ephemerids and Odonata, which are Archipterygota (incapable of laying the wings along the abdomen in repose), while the Plecoptera are true Neopterygota (capable of laying the wings along the abdomen in repose), and all of their morphological features ally the Plecoptera with the Orthopteroid Embiids, as I have maintained since first discussing the matter in 1915, although the facts brought out to prove this in a long series of papers treating of most of the external features of these insects, have been as utterly ignored as though they did not exist!

Embiids are sent in very rarely by the collectors from whom I obtain specimens for study, and I have been unable to examine all of the types which probably occur in the group, but the principal representatives of the group are apparently referable to one of the types shown in Figs. 35, 33 or 29. The Embiid types shown in Figs. 33 and 29 are very like the Plecopteran type shown in Fig. 46, and the Embiid type shown in Fig. 35 was possibly derived from an Isopteroid type like that shown in Fig. 37, although it is also like the head capsule of a Grylloblattid (Fig. 19) in many respects—a resemblance which is borne out by other features of the body as well. The head capsule of the Embiid shown in Fig. 29 is quite suggestive of that of the Dermapteran shown in Fig. 32, while the head of the Embiid shown in Fig. 33 resembles that of the Phasmid shown in Fig. 34, in some respects (compare also Figs. 29 and 18). As was mentioned above, these complicated resemblances are probably to be explained by the fact that all of these insects were apparently descended from Isoptera-like forebears in the common Orthopteroid stem which gave rise to the lines of descent of all of the Orthopteroid insects.

The Plecopteroid type of head capsule shown in Fig. 46, is apparently as primitive as any, and is very like that of the Embiid shown in Fig. 29, while both of these resemble the head of the Dermapteron shown in Fig. 32 in many respects. The Plecopteran type shown in Fig. 46 might be derived from Isopteroid precursors like those shown in Figs. 1 and 5, or it might have been derived from a Blattid prototype such as that shown in Fig. 14. Possibly the Plecopteran, Embiid and Dermapteran types (with the Grylloblattid type as well) lead back more directly to Isoptera-like forebears, and through these to the Blattids (and Mantids) as the nearest living representatives of the ultimate Orthopteroid ancestors from which all were descended, and this explanation of the complicated resemblances exhibited by the head capsules is as logical as any. The head capsule of the immature Plecopteron shown in Fig. 13 is strikingly like that of the Dermapteron shown in Fig. 15, and the head of the immature Plecopteron shown in Fig. 16 is somewhat suggestive of that of the Blattid shown in Fig. 14. The Plecopteran head shown in Fig. 11 is somewhat Dermapteroid, but not so much so as the one shown in Fig. 46 (compare with Fig. 17) which also resembles the head capsules of the Isoptera (Figs. 1 and 5), Grylloblattids (Fig. 19), leaping Orthoptera (Figs. 20 and 22) and Blattids (Fig. 14) as well, as was mentioned above.

The insects of the superorders Panisoptera, Panorthoptera and Panplecoptera, described above, constitute a division of the Neopterygota which may be referred to as the Paurometabola or Orthopteroid insects (also called the Orthopteradelphia) and all of them are the more or less direct descendants of the Protorthopteran-Protoblattid ancestral types forming the common ancestral Orthopteroid stem. If an attempt were made to reconstruct the Orthopteroid archetype (corresponding to the common Orthopteroid ancestors of these insects for the group) by selecting and combining in one figure all of the primitive or ancestral features preserved by certain of the living Orthopteroids, the composite type thus reconstructed would have a general habitus (or body appearance) intermediate between that of a typical Isopteran and Plecopteran (*i. e.,* rather slender in form, but not extremely so). The head would be intermediate in type between the Eremiaphilid and typical Isopteroid type. The thoracic sclerites would be Isopteroid (or Plecopteroid) in most particulars, but the tergal region would be somewhat more Plecopteroid or Embiioid than Isopteroid, since a postscutellum was doubtless quite well developed in the ancestral type. The wings would be Blattoid—or rather Protoblattoid, since these combine more of the primitive features of venation than do the wings of the other Orthopteroids. The legs would be Grylloblattoid. The abdomen would be intermediate between the Plecopteroid and Isopteroid type, but with the cerci more like those of the primitive Plecoptera, and with an ovipositor resembling that of *Grylloblatta* in many respects—and the genitalia of the male insect were probably Grylloblattoid in many respects. It is a simple matter to figure the Orthopteroid archetype from these " specifications," but it is preferable to defer doing so until all of the essential morphological details of the Orthopteroids have been depicted in a series of papers tracing the modifications of the external morphological features throughout the orders of insects from the phylogenetic standpoint (*i. e.,* with a view to determining which condition represents the primitive one most closely in each anatomical feature, after studying the range of modifications exhibited within each of the Orthopteroid orders). When such an Orthopteroid archetype is constructed, it will not only serve to illustrate the origin of the various Orthopteroid lines of descent, but also to illustrate the origin of the lines of descent of the rest of the Neopterygota as well.

Next above the Orthopteroid group (Orthopteradelphia, or Paurometabola in the broad sense of the term) in the evolutionary sequence, is the Psocoid or Hemipteroid group (Hemipteradelphia, or Parametabola in the broad sense of the term), including the Psocoptera (Zoraptera and other Psocids), Mallophaga, Anoplura, Hemiptera and probably the Thysanoptera also, although the closest affinities of the Thysanoptera have not been definitely determined. These Psocoid insects are intermediate between the Orthopteroids on the one hand, and the Holometabola on the other. The Psocids clearly merge with the Orthopteroids (such as the Isoptera, Blattids, etc.) on the one hand, and they approach the Neuroptera and Hymenoptera among the Holometabola in many features of their external morphology, while their close relatives, the Hemiptera, exhibit a type of development approximating that of the Holometabola strikingly closely (and the Thysanoptera also adumbrate Holometabolism to some extent). The development of male Coccids, for example, offers a very close approximation to the Holometabolous condition, since they pass through stages which have been termed larval and pupal stadia; and in the Aleyrodidae, as is pointed out by Comstock, 1924 ("Introduction to Entomology," p. 438) the designations larvae and pupae are quite appropriate for these forms since there is a quiescent pupal instar in which the wings become external, while the wings develop internally in the Aleyrodidae, during the larval instars, from wing-buds *inside* the body wall.[2] The division of insects into Endopterygota and Exopterygota on the basis of the internal or external development of the wings is thus seen to be untenable, and would separate the Aleyrodidae from their immediate relative the Coccidae (which are "Exopterygota..) if insects are grouped according to this unnatural method; and when the students of insect phylogeny will examine the evidence easily available to every one, they will discover that

[2] These facts have a very important bearing on the theory of the origin and development of Holometabolism in insects according to the mutational view, and are not in harmony with the idea that Holometabolous larvae are "free-living embryos," as will be discussed in a later paper dealing with the subject of Holometabolism more at length than it is possible to do at this time.

the natural division of Pterygotan insects is into Archipterygota and Neopterygota, as I have tried to prove for more than a decade. The Holometabola merge too imperceptibly with the Psocoids and Orthopteroids to be separated from them; but all of these insects differ markedly from the Ephemerids and Odonata, which had a different origin from these Orthopteroid derivatives, since the Odonata and Ephemerida were descended more or less directly from Palaeodictyopteroid forebears, while the Orthopteroids, Psocoids and Holometabola are descended from a common Orthopteroid stem which leads back to *Synarmogoge*-like forms and through these to the common Palaeodictyopteroid stem which threw off the ancestors of the Ephemerids and Odonata at a much lower level than that at which the *Synarmogoge*-like ancestors of the Orthopteroid stem-forms arose. The relationships of the members of the Psocoid and Holometabolous groups to each other and to the other Neopterygota as indicated by a study of the head capsule of these insects will be discussed more fully in a later paper, since a more detailed discussion of the subject should be illustrated by more figures than can be included in the present article; but the principal "key" forms from which most of the other types were derived may be discussed in this paper, which includes all of the more important Orthopteroid types leading to these "key" forms from which the rest of the Psocoids and Holometabola were derived.

Among the Parametabola or Hemipteradelphia, which may be referred to as the Psocoid or Hemipteroid insects (*i. e.*, the Psocoptera, Mallophaga, Anoplura, Hemiptera, and probably the Thysanoptera also) the Psocids, Mallophaga and Anoplura form a compact group or superorder, the Panpsocoptera, in which the Psocids, or Psocoptera, represent the ancestral types from which the Mallophaga were derived, and these in turn apparently gave rise to the Anoplura. Since the Psocids (Psocoptera) are clearly the original types from which these others were derived, it is only necessary to discuss the origin of the Psocids at the present time, because what applies to them applies equally to their descendants, the Mallophaga (with the Anoplura). The most primitive representatives of the Psocids are the Zoraptera, which form a suborder distinct from the Eupsocoptera, or the rest of the Psocoptera. The venation of the Zoraptera is out-and-out Psocopteran (see discussion by Crampton, 1921, 1922, etc.), and the terminal abdominal structures etc., as described by Crampton, 1929, clearly approach the Psocids of the *Embidopsocus* type (and *Archipsocus* as well). Not only does the head capsule bear out this relationship, but it is also attested by many other features of the external morphology of these insects. Comstock, Tillyard, Handlirsch, Karny, and other students of insect phylogeny, however, are unwilling to accept this evidence, and it will doubtless be many years before the conclusive evidence has won its way to convince the students of the Psocid group that the Zoraptera are really members of the order Psocoptera! As is shown in Fig. 47, the head of the Zorapteron *Zorotypus* is extremely like that of the Psocid *Embidopsocus,* shown in Fig. 48 (a resemblance that is borne out by a comparison of the terminal abdominal structures of *Zorotypus* with those of *Embidopsocus*), and is clearly of the Psocid type shown in Fig. 8, although the postclypeus *pc* is hugely developed in the Psocid shown in Fig. 8 (which was figured for the purpose of comparison with the Blattid shown in Fig. 9, in which the postclypeus is also hugely developed) and the head of the Psocid *Archipsocus,* in which the clypeus is not quite so overdeveloped, is better for comparison with the head of *Zorotypus,* on this account. The head of *Zorotypus* is very suggestive of the Plecopteran type shown in Fig. 46 (as I have pointed out before), and the two types were evidently derived from essentially the same source. The *Zorotypus* type likewise resembles the Isopteroid type shown in Fig. 1 quite markedly (which is in harmony with the evidence from other sources pointing to a close relationship between the Zoraptera and Isoptera), and it also approaches the Blattid type shown in Fig. 14, in certain respects, and is rather like that of the Mantid shown in Fig. 42 (as is also the case with the Psocid head shown in Fig. 41). There are also points of similarity between the *Zorotypus* type (Fig. 47) and the Forficulid type shown in Fig. 32, and *Zorotypus* likewise exhibits a resemblance to the Grylloblattid type shown in Fig. 19, in some respects, although the resemblance is not very strong in this case. As in the other instances cited above, the intricate interrelationships indicated by the head capsule in all these insects are doubtless to be attributed to the fact that they were all descended from Isoptera-like forebears in the common Orthopteroid stem. Within the Eupsocoptera proper, the head of the

Psocid *Embidopsocus* shown in Fig. 48 (which is not far removed from the *Zorotypus* type) evidently leads to the *Atropus* type shown in Fig. 2, in which the clypeus *c* tends to become more tumid (a tendency already begun in *Embidopsocus*) and encroaches more upon the frontal region behind it than is the case in *Embidopsocus.* The Psocid *Archipsocus,* which is closely related to both *Zorotypus* and *Embidopsocus* exhibits a stronger tendency toward the tumescence and enlargement of the clypeus than is the case with *Embidopsocus,* and evidently leads to the Psocid type shown in Fig. 8, in which the clypeus (or postclypeal region *pc*) is hugely developed; and the Psocid type shown in Fig. 41 exhibits a similar tendency for the postclypeal region to become overdeveloped. The Psocid type shown in Fig. 23 is extremely elongated "dorso-ventrally" and the eyes are situated more dorsally, suggesting the precursor of the Thysanopteran type of head capsule shown in Fig. 28, while the Psocid type shown in Fig. 8 suggests the precursor of the Hemipteron type shown in Fig. 6. The Psocid shown in Fig. 2 exhibits points of resemblance to the Orthopteroid head shown in Fig. 4, which has a tumid clypeus *c,* and the Psocid head shown in Fig. 8 is remarkably like that of the Blattid shown in Fig. 9, in the overdevelopment of the postclypeal region *pc,* although the eyes are more Isopteroid in the Psocid shown in Fig. 8, and the Isopteron shown in Fig. 5 likewise exhibits a marked tendency toward the development of a tumid, enlarged postclypeal region *pc.* The Psocid type shown in Fig. 8 likewise exhibits certain resemblances to the Hymenopteran type shown in Fig. 10 (in which the postclypeus *pc* is also somewhat tumid and enlarged), as also does the Psocid shown in Fig. 41, and this Psocid likewise resembles the Mantid shown in Fig. 42 in some respects (such as the triangular head, location of the ocelli, etc.). All of these Psocid types may lead back through the *Zorotypus* type (Fig. 47) to some Isopteran type (Fig. 1) and eventually to the original Orthopteroid type exemplified by *Eremiaphila* (Fig. 2).

The Hemipteran head shown in Fig. 6 may be referred to as "deltoid" to indicate that it is triangular in shape, with the angles much sharper (or more acute) than in the case in a typical triangular head. The eyes of this Hemipteron are like those of the Psocid shown in Fig. 8, and the greatly enlarged postclypeus *pc* of the Hemipteron shown in Fig. 6 suggests an origin in a type of head like that of the Psocid shown in Fig. 8 (which is in harmony with the fact that the venation of the Psocids and Hemiptera such as the Psyllidae is remarkably similar, as was pointed out by Crampton, 1922; and the fossil Psocoptera and Hemiptera were strikingly similar venationally, as Tillyard has shown in several papers). On the other hand, the hugely developed postclypeal region *pc* of the roach shown in Fig. 7 could readily serve as the prototype of the overdeveloped postclypeus *pc* of the Hemipteron shown in Fig. 6, and in Vol. 54, p. 223 of the *Canadian Entomologist,* I have called attention to the resemblance between the venation of a typical Homopterous Hemipteron and that of the Blattids or Protoblattids (the anal area of a Blattid tegmen is very like the clavus of Hemiptera and many features of the Blattoid fore wing suggest the precursors of the Hemipteroid types) so that it is possible to regard the Psocids and Hemiptera as representing two parallel lines of development leading back to the same Blattoid (or Isoptera-like) ancestry in the common Orthopteroid ancestral stem. Karny, 1925 (page 232 of Part 3, Heft 2, of Abt. IX, of the Handbuch der biologischen Arbeitsmethoden) however, criticizes this view severely, and maintains the old discredited view that the Hemiptera are descended from the Palaeodictyopteroid order Eugereonoptera (represented by the fossil insect *Eugereon*) despite the fact that the untenability of this view has been demonstrated in a paper published in Vol. 22, p. 1, of the Bulletin of the Brooklyn Ent. Soc., for Feb. 1927. More recently, however, Karny seems to be "weakening" in this belief (see *Treubia,* Vol. 12, p. 456 for Dec. 1930) since he is now obliged to assume that the Hemiptera may represent a diphyletic group "die in zwei Teile zerlegt werden muss, von denen der eine von Eugereon, der andere von Permopsocida herzuleiten waere." In other words, he is now inclined to consider that the Hemiptera Heteroptera are derived from *Eugereon,* while the Homoptera are derived from the Psocids of the *Permopsocida*-type, having been forced to this conclusion by the fact that Tillyard, 1926 (*American Jour. Science,* Vol. 11, p. 315) has shown that the Permian Homoptera and Psocoptera merge in a common ancestry—a relationship which I pointed out a decade ago (*Psyche,* Vol. 39, p. 23, for 1922) from a study of the wings of the Psocids and Psyllids, etc. It is wholly impossible, however, to regard the Hemiptera as diphyletic, since the fundamental resemblances in the mouthparts and other structural details of the Homoptera and Heteroptera admit of no other interpretation than that they were derived from the same source, and any attempt to derive the Heteroptera from the Archipterygotan order Eugereonoptera (*i. e., Eugereon*) and the Homoptera from the Neopterygotan order Psocoptera is bound to result in so many contraditions that whoever makes a real study of the comparative anatomy of the forms in question will soon see the impossibility of considering *Eugereon* at all in this connection; and entomologists such as Imms, 1931 ("Recent Advances in Entomology," p. 85, etc.) will realize the futility of stating in one place that "it appears likely that the Hemiptera and Psocoptera are divergent developments from a common stock" while seeking elsewhere to derive the Hemiptera from *Eugereon*. *Eugereon* belongs in the division Archipterygota, which is on an entirely different branch of winged insects than that of the Orthopteroids from which the Hemiptera were descended (*i. e.,* the Neopterygota), and it is the Ephemerids and Odonata (*not* the Orthopteroids, Hemipteroids and Holometabola) which are the living forms most closely related to *Eugereon* and the other Palaeodictyopteroids. The relationship of the Hemiptera (Fig. 6) to the Thysanoptera (Fig. 28) is the result of their mutual relationship to the Psocids (Figs. 23 and 8) which in turn are related to the Orthopteroid forms giving rise to the saltatorial Orthoptera, etc.

In several publications (*e. g.,* on page 474 of Vol. 37 of the *Journal* of the N. Y. Entomological Society for 1929) I have called attention to the fact that the head of a typical Thysanopteron is like that of an Acridid Orthopteron (such as *Leptysma,* for example) and likewise pointed out that the Thysanopteran venation could readily be derived from that of such Orthoptera as *Dionconema,* while it is approached by the venation of certain Psocoptera (see also the *Canadian Entomologist,* Vol. 54, p. 223, for 1922, and the *Ent. News,* Vol. 32, p. 97 for 1921, etc.), and resembles that of the Hymenoptera in certain respects. In searching for an Orthopteran type of head capsule resembling that of a typical Thysanopteron shown in Fig. 28, however, I found that the head capsule of a Tettigoniid such as the one shown in Fig. 27 is more like that of the Thysanopteron (Fig. 28) than is the case with the heads of any Acridid Orthoptera, since the eyes and antennae are more dorsally located in the Orthopteron shown in Fig. 27, like the condition exhibited by the Thysanopteron (Fig. 28). Certain Tettigoniids with reduced venation approach the Thysanoptera in this respect, and this might be taken to indicate that the Thysanoptera are descended from Tettigonioid ancestors, since the heads are remarkably similar in both groups. On the other hand, the head of certain Psocoptera such as the one shown in Fig. 23 (a figure of the head of *Stigmatopathus,* redrawn from Enderlein, 1903) shows a close approach to the Thysanopteran type portrayed in Fig. 28, since the head is dolichocephalous or greatly elongated "dorso-ventrally" and the eyes are located dorsally—although the antennae were not drawn by Enderlein, so that the position of these is not evident (they must be borne far up in the head region, however, since they are always above the postclypeus *pc,* which is very large in this Psocid. Since the venation of certain Psocoptera such as *Embidotroctes,* etc., approaches the Thysanopteran type (see *Ent. News,* Vol. 32, p. 103, for 1921, *Can. Ent.,* 54, p. 222, etc.) quite markedly (but *not* the Zorapteran type as Karny maintains) it would appear that the Psocoptera also are very like the ancestors of the Thysanoptera. The terminal abdominal structures of female Thysanoptera, Cicadidae and Siricid Hymenoptera are very similar, as was pointed out in the *Journal* of the N. Y. Ent. Soc, 37, p. 474, and the venation of certain fossil Thysanoptera approaches that of certain Hymenoptera in some respects, thus making it very difficult to unravel the tangled skein of evidence leading to the ancestors of the Thysanoptera. It seems quite evident however, that the lines of descent of the Thysanoptera, Psocids and Hemiptera lead back to Orthopteroid precursors resembling the Isopteron-like ancestors of the Orthoptera in the common Protorthopteron-Protoblattid stem, and from a similar ancestry were derived the Hymenoptera and the rest of the Holometabola. The ancestors of the Thysanoptera and Psocoptera were apparently strikingly Orthoptera-like, as is shown by the fact that the head of the Psocid shown in Fig. 2 is very similar to that of the Orthopteron shown in Fig. 4, while that head of the Thysanopteron shown in Fig. 28 is strikingly similar to that of the Orthopteron shown in Fig. 27, yet both of these Orthopteran types must have had a common origin, unless we regard the Orthoptera as polyphyletic (which is not warranted by any known facts), and the common origin of both of the Orthopteran types was apparently very like that of the ancestors of the Thysanoptera and the Psocoptera.

The Holometabola include forms having the most varied types of heads in the adult condition, but when the larval heads of the most primitive families of each of the Holometabolous orders have been studied, it will doubtless appear that all of these larval types are traceable to a common Orthopteroid prototype. Even such specialized Holometabola as the Dipteron *Protoplasa* may preserve a very Orthopteroid head as a larva (see figures in BULLETIN Brooklyn Ent. Soc., 25, p. 239, for 1930), or at any rate the *Protoplasa* type leads back to a Panorpid type of larval head (figured in the above cited paper) which could be readily derived from an Orthopteroid prototype, by way of such primitive larval forms as those of *Sialis,* etc. Of the adult types, the heads of the Sialid Neuroptera and the Coleopteron *Harpalus* shown in Figs. 39 and 38 will serve to illustrate the original Holometabolous type sufficiently closely to attempt to trace the origin of the rest of the Holometabola, which were apparently derived from prototypes very like these Coleoptera and Neuroptera, and if we can determine the source of the Coleopteran and Neuropteran types, the question of the origin of the Holometabola will be solved (since the group is a monophyletic one—as is shown by the similarities of the larval forms which intergrade very strikingly). In both the *Harpalus* (Fig. 38) and *Sialis* (Fig. 39) type of head, the antennae are kataceratous (*i. e.,* located near the bases of the mandibles), and the eyes, which are rather small and Isopteroid, are located rather far down the sides of the head. This type of head capsule is rather suggestive of that of the Isopteron shown in Fig. 37, and may indicate that the ancestors of the Holometabola were Isoptera-like forms in the common Orthopteroid stem. This is in harmony with the fact that the Isoptera have preserved many ancestral features from this common Orthopteroid stem, and, with the Blattids, they are very like the ancestors of the Orthopteroid, Psocoids and Holometabola in general. The Isoptera, however, have not retained *all* of the ancestral features from this common origin, and their head capsules are modified somewhat along their own especial lines of development, so that in reconstructing the archetype for the Holometabola, other Orthopteroids besides the Isoptera must be taken into consideration, and other Holometabola besides *Harpalus* and *Sialis* must also be taken into consideration in attempting to reconstruct this archetypal form from which all of the Holometabola could be derived.

Although the Neuroptera have preserved the wings in a more primitive condition than those of the Coleoptera, the Coleoptera are nevertheless the most "Orthopteroid" of the Holometabolous insects, and the Orthopteroid forms most like their ancestors are the Dermaptera, as is indicated by a comparison of the maxillae, nota and wing bases, basal abdominal and posterior thoracic sclerites, etc. (see descriptions by Crampton, 1918, 1923, 1931, etc.). The Coleoptera selected to illustrate the features discussed in the present paper do not serve to bring out the resemblances between the Coleopterous and Dermapteran heads, however, but if one will refer to Fig. 90 of the head of the Coleopteron *Mycetophagus* (or to Fig. 89 of *Byturus*) in Stickney's paper on the head capsule of the Coleoptera (Illinois Biol. Monographs, Vol. 8, No. 1) for comparison with the Dermapteran head shown in Fig. 32 of the present paper, the resemblance between the two groups of insects will be found to include the head structures as well. The "brachycephalous" heads of the parasitic Coleoptera such as *Platypsyllus* and its relative *Leptinus,* shown in Figs. 30 and 31, of the present paper are strikingly similar to that of the parasitic Dermapteran *Hemimerus* shown in Fig. 12, and since *Leptinus* is not parasitic, the remarkable resemblance of its head to that of *Hemimerus* cannot be accounted for as the result of parasitism in both cases, but is apparently due to the operation of the same genes producing similar modificational results in both of these closely related orders of insects. This does not mean that the Coleoptera were descended from the Dermaptera themselves, but the Dermaptera were closely enough allied to their actual ancestors to have inherited many of the genes (which influence the modificational tendencies of insects) which the Coleoptera also inherited from their common Orthopteroid ancestry, and the modificational trends exhibited by the Dermaptera may thus "adumbrate" those also appearing in the Coleopterous descendants of their common ancestors, as happens in this modification of the head capsule and many other features of their external morphology.

The Embiid head shown in Fig. 29 and the Dermapteran head shown in Fig. 32 are very similar, and apparently were derived from a common source so that we would expect that the Coleopterous members of the Holometabola would likewise resemble certain Embiids if they were descended from a common ancestry with the Dermapters (derived from a common origin with the

Embiids), and indeed such is the case if we select the right Coleoptera to illustrate this. Thus for example Stickney's Fig. 60 of the head of the beetle *Sandalus* is very like that of the Embiid shown in Fig. 29 of the present paper, while his figure 111 of the Coleopteron *Plesiosis* is very like that of the Embiid shown in Fig. 35, and his figure 103 of the beetle *Arthromacra* is strikingly like that of the Embiid shown in Fig. 33, and so on.

The Embiids are the next of kin to the Plecoptera, and if certain Coleopterous head types resemble those of the Embiids, we would expect that other Coleopterous types might resemble those of the Plecopteran relatives of the Embiids also, and the resemblance between Stickney's Fig. 82 of the beetle *Phyconomus* and Fig. 46 of a Plecopteran head seems to bear out this expectation. On the other hand, the head of the beetle *Phyconomus* is quite suggestive of that of the Blattid shown in Fig. 14 in certain respects, and the modifications of the beetle type shown in Fig. 24 give the impression of being caused by genes like those producing the type of Blattid head shown in Fig. 26.

The types of beetle heads seem to run the whole gamut of Orthopteroid modifications, so that some of them could be referred to types in almost any of the Orthopteroid orders, and while the most of these resemblances might be laid to "convergence" it seems to me that the possibility of another explanation should at least be taken into consideration, and this other possibility may be briefly stated as follows. In the genetic make-up of the ancestral types composing the original Orthopteroid stock from which all of these forms were ultimately descended, there must have existed the "potentialities" (represented by certain genes) to form the various modifications exhibited by the heads of the Orthopteroid descendants of these forms, else the modifications could not have occurred, and if these genes were carried down to the Coleopteran descendants of these Orthopteroids as well, we would expect that these same genes, under the proper conditions (or in the proper combinations) would tend to repeat (with variations due to a slightly different genetic make-up) these modifications in essentially the same form as they occurred in the ancestral types, and this is what I mean by stating that the members of the Orthopteroid stem may "adumbrate" the modifications later appearing in some of their descendants (*e. g.*, in the Coleoptera). Certain modificational trends exhibited by *some* members of an ancestral group may reappear in *some* members of a derived group without *all* of the members of either group exhibiting these modifications, provided that the genes for these modifications, which may be "latent" (or inactive) in the forms which do not exhibit these modifications, are handed down to the derived group from the ancestral one. This discussion of the mechanism of "adumbration," however, leads us too far from the topic under consideration, and can be more readily understood if accompanied by illustrations of different anatomical features to bring out the principles involved, so that further discussion at this time would not be profitable, and I have called attention to this alternative explanation of the resemblances between the heads of the derived Coleoptera and the ancestral Orthopteroids merely to point out that "convergence" is not the only possible explanation for these facts, especially since the forms in question do not live under the same conditions, to produce similar modifications, as is implied in the idea of "convergence" (which likewise involves the old discredited principle of the inheritence of acquired characters or environmental influences).

The Protoblattids are the forms in the common Orthopteroid stem which have preserved most of the ancestral features of the Neuroptera (and of the rest of the Holometabola as well) and one would expect that the practically direct descendants of the Protoblattids, namely the Blattids, would preserve the head types characteristic of the Neuroptera, since the Blattids have retained certain other features extremely suggestive of the precursors of the Neuroptera. The Mantids, however seem to have preserved the head types which are the most suggestive of those of the Neuroptera, and since the Mantids are the nearest relatives of the Blattids, and form with them the same ordinal group Dictyoptera, they may be regarded as descended from the Protoblattids (or the common Protoblattid-Protorthopteran stem) almost as directly as the Blattids were. At any rate, the modificational tendencies exhibited by the Mantids are paralleled remarkably closely by the Neuropteran heads, as may be seen by comparing the Neuropteran head shown in Fig. 45, with that of the Mantid shown in Fig. 42, and as was mentioned above, these two heads are so strikingly similar that they could be interchanged without one's noting the difference, if he were not fore-warned to do so! Furthermore, the head of the Neuropteron *Chrysopa* shown in Fig. 64 of a paper dealing with the various types of Neuropteran heads, published in Vol. 14, p. 65, of the Annals of the Ent. Soc. of America for 1921, is extremely similar to that of the Mantid shown in Fig. 21 of the present paper, thus indicating that the developmental tendencies exhibited by the two groups are very similar. On the other hand, the head of the Neuropteron *Chauliodes* shown in Fig. 34 of the above-cited paper, is very like that of the termite shown in Fig. 1 of the present paper, and the head of the primitive Neuropteron *Sialis* shown in Fig. 39 of the present paper is very like that of the Embiid shown in Fig. 33, or even that of the termite shown in Fig. 37, to which the Embiid type shown in Fig. 33 might also be traced. The *Sialid* type (Fig. 39) also resembles the Dermapteran type shown in Fig. 32, and it is possible that all of these types may lead to a termite type and through it to the Blattid-Mantid common type, which furnishes the archetype of the Orthopteroids in general. In other words, the archetypal head from which that of the Orthopteroids, Psocoids and Holometabola in general were derived, could be reconstructed by combining the ancestral features exhibited by the Blattid-Mantid group, with those of the Isoptera, which also belong to the same superorder (Panisoptera) to which the Blattid-Mantid group (comprising the order Dictyoptera) belongs. When one realizes the close interrelationships of the Blattids, Mantids and Isoptera, which are the nearest living representatives of the common Protorthopteran-Protoblattid stem from which the rest of the Neopterygota were derived, it is not surprising that some members of this "ancestral" group should adumbrate the various modificational tendencies exhibited by some of the other Orthopteroids, Psocoids and Holometabolous insects, and there are numerous indications that if some one type must be chosen as the nearest approach to the more immediate precursors of the Psocoids and Holometabola, the Isopteroid type would come the nearest to fulfilling this requirement (note also the resemblance between the head of a larval *Raphidia,* such as that shown in Fig. 41 of Vol. 14, p. 107 of the *Annals* Ent. Soc. America for 1921, and that of a termite of the soldier caste—a resemblance which would lend further weight to the idea that the Isoptera are very like the more immediate ancestors of the lower representatives of the Holometabola such as the Neuroptera, etc.). Since the phenomenon of "heterospecialization," or unequal specialization in the various parts of a single insect complicates these matters, however, it is not possible to select a single Isopteron as the prototype of these other forms, since all Isoptera exhibit some specializations of their own, and are not wholly primitive in all respects. They may retain certain ancestral features which the Blattids and Mantids may lose, but the Blattids and Mantids may retain other ancestral features which the Isoptera lose, so that a serviceable prototype for all of the Orthopteroids, Psocoids, and Holometabola must be constructed from many sources, and the Isoptera alone are insufficient for this purpose.

While the head capsule of such primitive representatives of the Hymenoptera as the Tenthredinoidea (*e. g.,* the one shown in Fig. 78 of the paper in the 1921 "Annals" cited above) are extremely suggestive of an origin in such forms as the Mantid shown in Fig. 21 of this paper, and the triangular head of a Thynnid Hymenopteron such as the one shown in Fig. 10 is rather suggestive of a triangular head type occurring in certain Mantids (Fig. 42), these Hymenopterous types are nevertheless very similar to that of the Isopteron shown in Figs. 1 and 5 (or even of the Blattids shown in Figs. 7 and 9), and the Hymenoptera[3] agree with the Coleoptera and Neuroptera in pointing to an origin in

[3] The Coleoptera and Hymenoptera (which have been grouped in the superorder Pancoleoptera because of their many points of resemblance, such as the tendency for the metathoracic episternum and epimeron to assume a horizontal position, the absence of a meron in the mesothoracic coxae, etc.) agree in exhibiting a marked tendency toward the formation of a bulb (*b* of Figs. 10, 38, etc.) in the scape of the antenna. Although the Dermaptera, such as the ones shown in Figs. 15, 32, etc., exhibit a slight tendency to form a bulb, certain Blattids, such as the one shown in Fig. 14, exhibit a more pronounced tendency toward the formation of a well developed bulb, and this fact may have some phylogenetic significance. The Zoraptera (Fig. 47) and certain Hemiptera (*Anasa tristis,* etc.) likewise tend to develop a bulb at the base of the scape, thus indicating their intermediate character between the Orthopteroids and Holometabola. It is strange that most Neuroptera do not exhibit this tendency, although the Neuropteron shown in Fig. 45 exhibits a slight tendency in this direction.

some prototype much like an Isopteron, but also exhibiting some Mantid and Blattid features.

The head of the adult Mecopteron shown in Fig. 49 suggests an origin in some Blattid prototype like that shown in Fig. 26, from which the Coleopteran type shown in Fig. 24 may have received its modificational tendencies (if we use the Blattid type merely to illustrate what modificational potentialities were possibly present in the genetic composition of the original Orthopteroid stock) but the head of this adult Mecopteron is not so suitable as that of the larval Mecopteron *Chorista* shown in Fig. 44, for indicating the probable origin of the typical Mecopteron head, since the head of the *Chorista* larva shown in Fig. 44 points to an Isopteroid precursor rather similar to the types shown in Figs. 1 and 5. The head of a larval *Panorpa,* such as the one shown in Fig. 30 of Vol. 25, p. 257 of the BULLETIN of the Brooklyn Ent. Soc. for 1930 (from which the primitive Dipteran types shown in Figs. 13 and 31 of the same paper, were apparently derived) suggests an origin in some Isopteroid type like that shown in Fig. 37, and likewise exhibits certain points of similarity with the Embiid and Dermapteran types shown in Figs. 33, 32, etc., which may also have been derived from the Isopteran type shown in Fig. 37, so that a resemblance to the Embiids and Dermaptera does not preclude an origin from an Isopteroid type which may be "ancestral" to the latter also.

The head of the larval Mecopteron *Chorista* shown in Fig. 44, is particularly interesting because it illustrates almost diagrammatically, the formation of sutures other than the epicranial suture (made up of the coronal suture *cs* and the frontal sutures *fs* of Fig. 44). Postfrontal sutures *pfs* are given off on each side of the coronal suture *cs,* and the temporal sutures *ts* are retained, while the occipital suture (corresponding to the suture labeled *os* in the beetle shown in Fig. 38) is apparently represented by the incomplete suture *os* of Fig 44. The parietal region is divided into an anteparietal (*ap*) and postparietal region (*pp*) in Fig. 44, and the temples or temporal regions *t* are marked off by the temporal sutures *ts.* Such temporal regions are marked off in many Tenthredinoidea, as well as in *Grylloblatta,* certain Mantids, Phasmids, and other insects (as well as certain Sialoid Neuropterous larvae, etc.), and the region included between the temporal sutures *ts,* behind the postfrontal suture *pfs* in Fig. 44, is very suggestive of the similarly located area in the Mantid shown in Fig. 21, although these areas may not be exactly the same in both insects.

In Vol. 10, p. 338 of the *Annals* of the Entomological Soc. of America, for 1917, two series of evolutionary stages of the heads of Neuroptera, Mecoptera and Diptera, representing both the short headed and the long headed types, are shown. These series illustrate fairly well the evolution of the types of head in the adult Diptera, Mecoptera, etc., but they do not serve as well as do the larval heads of the Diptera shown in the BULLETIN of the Brooklyn Ent. Soc, Vol. 30, p. 257, for 1930, for illustrating the derivation of the primitive Dipterous type from *Panorpa*-like precursors, and for tracing the type exhibited by a *Panorpa* larva or the Mecopteran larva shown in Fig. 44 (of the present paper) to an ultimate origin in some Isopteroid type like that shown in Figs. 1, 5, or 37.

The heads of the adults of the primitive Trichopteron *Philopotamus* and of the primitive Lepidopteron *Mnemonica,* are compared in Figs. 2 and 4, of Vol. 27, page 37 of *Psyche* for 1920. Both of these types suggest an ultimate origin in some Isopteroid type like the Isopteron shown in Fig. 37 (or in the Embiid type shown in Fig. 33, which was itself derived from the same Isopteroid type shown in Fig. 37), and the heads of larval Trichoptera (which are somewhat more primitive than those of larval Lepidoptera) apparently lead back to Isopteroid precursors.

The different head types occurring in the Holometabola and other insects descended from the primitive Orthopteroids, will be discussed more in detail in another paper, since only the "key" forms from which these others were derived have been included in the present paper, the purpose of which has been to present the principal Orthopteroid head types to which the other forms may be referred for comparison, in attempting to determine the sources from which they were derived.

The lines of descent indicated by a study of the head capsule may be briefly described as follows. From Crustaceoid prototypes resembling *Mysis, Apseudes,* etc., were derived the head types of the *Machilis*-like Thysanura, which lead through the *Lepisma* type to the lower Pterygotan types represented by immature Ephemerids, which have preserved as nearly as any living forms the features of the Palaeodictyopteroid precursors of the rest of the Pterygota. The head of the fossil insect *Synarmogoge* which serves to connect the Palaeodictyopteroids with the ancestral Orthopteroid insects, is not known, but the head capsule of a naiad (or "larva") of the Ephemerid *Blasturus* suggests an approach to the Orthopteroid type, and the lower Orthopteroid heads could very readily be derived from *Blasturoid* prototypes. The archetype for the primitive Orthopteroids might be reconstructed from the head capsules of the Blattids and Mantids, with additions from the head capsules of the Isoptera, and the Isopteroid type furnishes an approximation of the more immediate precursors of the forms leading to the rest of the Orthopteroids, Psocoids and Holometabolous insects, since the "bush-like (closely interrelated) lines of descent of the other Orthopteroid, Psocoid and Holometabolous types appear to converge upon the Isopteroid type as much as any single type of head capsule. From the Isopteroid type diverge the lines leading through the Grylloblattoid and Forficuloid types to the Orthoptera (s. str.) on the one hand, and to the Phasmids on the other, within the superorder Panorthoptera, while the Isopteroid type also appears to lead to the Embiid and Plecopteran types in the Panplecopteran superorder. The Isopteroid type likewise appears to represent as clearly as any one type does, the precursor of the Psocoid type which in turn leads to the Mallophagan type from which the Anopluran type was apparently derived, although the Anopluran type also suggests affinities with the Hemipteroid type. The Hemipteran types were apparently derived from Psocoid prototypes, with which the Thysanopteran types have much in common, although the Thysanopteran types may have been derived from Orthopteran forebears, more directly. The Coleopteran, Hymenopteran and Neuropteran types of head capsule are the most primitive of the Holometabolous types, and could be derived from Isopteroid prototypes as readily as any. The larval Strepsipteran heads could be derived from Meloid prototypes, and the heads of larval fleas are quite similar to those of certain larval Trichoptera. The heads of adult Trichoptera and Lepidoptera of the primitive types are strikingly similar, and might be derived from Isopteroid prototypes, while the heads and adult and larval Diptera and Mecoptera are remarkably alike, and apparently also lead back to Isopteroid prototypes from which the Neuropteran and other primitive Holometabolous heads were derived.

BIBLIOGRAPHY

Berlese, 1909. Gli Insetti.

Comstock & Kochi, 1902. The skeleton of the head of insects. Amer. Nat., 36, p. 13.

Comstock, 1924. An Introduction to Entomology.

Crampton, 1915–1932. 1915, The thoracic sclerites and systematic position of Grylloblatta campodeiformis, etc., Ent. News, 26, p. 337. 1917a, A phylogenetic study of the larval and adult head in Neuroptera, Mecoptera, Diptera and Trichoptera, Annals Ent. Soc. America, 10, p. 337. 1917b, A phylogenetic study of the lateral head, neck and prothoracic regions in some Apterygota and lower Pterygota, Ent. News, 28, p. 398. 1918, A phylogenetic study of the terga and wingbases in Embiids, Plecoptera, Dermaptera and Coleoptera, Psyche, 25, p. 4. 1919, A phylogenetic study of the mesothoracic terga and wingbases in Hymenoptera, Neuroptera, Mecoptera, Diptera, Trichoptera and Lepidoptera, Psyche, 26, p. 58. 1920a, Some anatomical details of the remarkable winged Zorapteron, Zorotypus, etc., Proc. Ent. Soc. Washington, 22, p. 98. 1920b, A comparison of the external anatomy of the lower Lepidoptera and Trichoptera, etc., Psyche, 27, p. 23. 1921a, A phylogenetic study of the venation of the forewings of the Homoptera, Thysanoptera, Psocids, etc., Ent. News, 32, p. 97. 1921b, A further comparison of the wings of Zoraptera, Psocids, etc., Canadian Entomologist, 53, p. 110. 1921c, The sclerites of the head and the mouthparts of certain immature and adult insects, Annals Ent. Soc. America, 14, p. 65. 1922a, Notes on the relationships indicated by the venation of the wings of insects, Can. Ent., 54, p. 206. 1922b, Evidences of relationship indicated by the venation of the fore wings of certain insects with especial reference to the Hemiptera-Homoptera, Psyche, 29, p. 23. 1922c, The derivation of certain types of head capsule in insects from Crustacean prototypes, Proc. Ent. Soc. Washington, 24, p. 153. 1923a, A comparison of the terminal abdominal structures, etc., of Mastotermes darwinensis with those of the roach Periplaneta americana, Bulletin Brooklyn Ent. Soc., 18, p. 85. 1923b, A phylogenetic comparison of the maxillae throughout the orders of insects, Jour. N. Y. Ent. Soc., 31, p. 77. 1924, The phylogeny and classification of insects, Pomona Journal Ent. & Zool., 16, p. 33. 1925. A phylogenetic study of the labium of holometabolous insects, etc., Proc. Ent. Soc. Washington, 27, p. 68. 1925, The external anatomy of the head and abdomen of the roach Periplaneta americana, Psyche, 32, p. 195. 1926a, The affinities of Grylloblatta indicated by a study of the head and its appendages, Psyche, 33, p. 78. 1926b, A comparison of the neck and prothoracic sclerites throughout the orders of insects from the standpoint of phylogeny, Trans. Amer. Ent. Soc., 52, p. 199. 1927, The abdominal structures of the orthopteroid family Grylloblattidae and the relationships of the group, Pan Pacific Ent., 3, p. 115. 1927, Eugereon and the ancestry of the Hemiptera, Psocids and Hymenoptera, Bulletin Brooklyn Ent. Soc., 22, p. 1. 1928, The evolution of the head region in lower arthropods and its bearing upon the origin and relationships of the arthropodan groups, Canadian Entomologist, 60, p. 129 and p. 284. 1928, The grouping of the insectan orders and their lines of descent, The Entomologist, 61, p. 82. 1928, Anatomical evidence that Cylindracheta is a Gryllotalpoid not an Embiid, Entomologische Mitteilungen, 17, p. 252. 1929, The terminal abdominal structures of female insects compared throughout the orders from the standpoint of phylogeny, Jour, N. Y. Ent. Soc., 37, p. 453. 1930a, The wings of the remarkable archaic Mecopteron Notiothauma reedi with remarks on their protoblattid affinities, Psyche, 37, p. 83. 1930b, The head structures of the Orthopteron Stenopelmatus, etc., Pan Pacific Ent., 6, p. 97. 1930c, A comparison of the more important structural details of the larva of the archaic tanyderid dipteron Protoplasa fitchii with other Holometabola from the standpoint of phyogeny, Bullet. Brooklyn Ent. Soc., 25, p. 239. 1931, A phylogenetic study of the posterior metathoracic and basal abdominal structures of insects with particular reference to the Holometabola, Jour. N. Y. Ent. Soc., 39, p. 323. 1932, A review of the evidence of the affinities of the Grylloblattidae given in the Jour. N. Y. Ent. Soc., Vol. 40.

Hoke, 1924. The anatomy of the head and mouthparts of Plecoptera, Jour. of Morphology, 38, p. 347.

Handlirsch, 1909 & 1925. Die fossilen Insekten & Band 3 of Schroeder's Handbuch der Entomologie.

Imms, 1924. A general Textbook of Entomology.

Karny, 1925. Die Methoden der phylogenetischen Forschung, Handbuch der biol. Arbeitsmethoden, Abt. IX, etc.

Karny, 1930. Zur Systematik der orthopteroiden Insekten, II, Treubia, 12, p. 431.

MacGillivray, 1923. External Insect Anatomy.

Otanes, 1922. Head of Mecoptera, Annals Ent. Soc. America, 15, p. 310.

Peterson, 1916. Head Capsule and Mouthparts of Diptera, III. Biol. Monographs, Vol. 3, No. 2, p. 1.

Stickney, 1923. Head Capsule of Coleoptera, Ill. Bio. Monogr., Vol. 8, p. 1.

Snodgrass, 1927. Head and mouthparts of the cicada, Proc. Ent. Soc. Washington, 29, p. 1.

Snodgrass, 1928. Morphology and evolution of the insect head and its appendages, Smithsonian Misc. Collections, Vol. 81, p. 1.

Tillyard, 1918–1928. Mesozoic Insects of Queensland, No. 4, Proc. Linn. Soc. N. S. Wales, 43, p. 568, 1919, Ibid, No. 5, Ibid, 44, p. 194. 1919, The panorpoid complex, Ibid, p. 533. Kansas Permian Insects, Amer. Jour. Science, 8, p. 111. 1926, The Insects of Australia & New Zealand. 1926, Kansas Permian Insects, Pt. 8, The order Copeognatha, Amer. Jour. Science, 11, p. 315. 1928, The family Delopteridae with a discussion of its ordinal position, Ibid., Vol. 16, p. 469.

Walker, 1931. On the clypeus and labium of primitive insects, Can. Ent., 63, p. 75.

Walker, 1931. On the anatomy of Grylloblatta campodeiformis, Annals. Ent. Soc. America, 24, p. 519.

Yuasa, 1920. The anatomy of the head and mouthparts of Orthoptera and Euplexoptera, Jour, Morphology, 33, p. 251.

Abbreviations

ac..............Anteclypeus
af..............Antennifer
ap..............Anteparietalia
b..............Bulb
c..............Clypeus
ci..............Clypeal sclerites (Clypeites)
cs..............Coronal suture (stem of epicranial suture)
e..............Compound eye
f..............Frons or front

fs.............Frontal suture (arms of epicranial suture)
g..............Gena
l..............Labrum
md............Mandible
mx............Maxilla
mxp...........Maxillary palpus
o..............Ocelli
oc.............Occiput
os.............Occipital suture
p..............Parietalia
pc.............Postclypeus
pfs............Postfrontal suture
pp.............Postparietalia
s..............Scape
sg.............Subgena
t..............Temples or tempora
ts.............Temporal suture
x..............Frontal or pretentorial pits

Explanation of Plates IV–VIII.

All figures represent the head capsule in frontal view. The basal segments of the antennae are shown, and the mandibles are the only moutparts represented.

Fig. 1. Alate caste of an Isopteron, Syntermes.
Fig. 2. A Psocid (Psocopteron), Atropus.
Fig. 3. A Gryllid Orthopteron.
Fig. 4. A Gryllid Orthopteron, Myrmecophila.
Fig. 5. Alate caste of an Isopteron, Kalotermes.
Fig. 6. A Jassid (Cicadellid) Hemipteron.
Fig. 7. A Blattid Dictyopteron, Ceratinoptera.
Fig. 8. A Psocopteron (Psocid), Psocus.
Fig. 9. A Blattid Dictyopteron, Therea.
Fig. 10. A Thynnid Hymenopteron.
Fig. 11. An immature Plecopteron, Pteronarcys.
Fig. 12. A Dermapteron, Hemimerus.
Fig. 13. An immature Plecopteron, Perla.
Fig. 14. A Blattid Dictyopteron, Cryptocercus.
Fig. 15. A Dermapteron, Arixenia.
Fig. 16. An immature Plecopteron, Peltoperla.
Fig. 17. A Dermapteron, Anisolabis.

Fig. 18. A Phasmid, Timema.
Fig. 19. A full-grown nymph of Grylloblatta barberi.
Fig. 20. An Orthopteron, Gryllotalpa.
Fig. 21. A Mantid Dictyopteron, Eremiaphila.
Fig. 22. An Orthopteron, Stenopelmatus.
Fig. 23. A Psocopteron (Psocid), Stigmatopathus—after Enderlein, 1903, Oedemerid.
Fig. 24. A Philippine Oedemerid Coleopteron related to Sessinia.
Fig. 25. A Gryllid Orthopteron, Phylloscirtus.
Fig. 26. A Blattid Dictyopteron, of the group Perisphaerina.
Fig. 27. A Tettigoniid Orthopteron, Clonia.
Fig. 28. A Thysanopteron.
Fig. 29. An Embiopteron (Embiid) Rhagadochir—after Enderlein, 1912.
Fig. 30. A Platypsyllid Coleopteron, Platypsyllus.
Fig. 31. A Leptinid Coleopteron, Leptinus.
Fig. 32. A Dermapteron, Diplatys.
Fig. 33. An Embiopteron (Embiid) winged male of Olintha.
Fig. 34. A Phasmid, Anisomorpha.
Fig. 35. An Embiopteron (Embiid), Embia, female.
Fig. 36. A Gryllid Orthopteron, Gryllus.
Fig. 37. An Isopteron, Mastotermes.
Fig. 38. A Carabid Coleopteron, Harpalus.
Fig. 39. A Sialid Neuropteron, Sialis.
Fig. 40. A Tettigid Orthopteron, Paxilla.
Fig. 41. A Psocopteron (Psocid), Psocus.
Fig. 42. A Mantid Dictyopteron, Mantoidea.
Fig. 43. A Tridactylid Orthopteron, Rhipipteryx.
Fig. 44. A larval Mecopteron, Chorista (first stage larva).
Fig. 45. A Mantispid Neuropteron, Mantispa.
Fig. 46. A Plecopteron, Leuctra.
Fig. 47. A Psocopteron (Psocid), Zorotypus, winged caste.
Fig. 48. A Psocopteron (Psocid), Embidopsocus.
Fig. 49. A Mecopteron, Merope.

Omosita discoidea (*Coleoptera, Nitidulidae*)—One specimen of this species was obtained at Avenel, N. J., July 4, 1931, by baiting. This constitutes a new record for eastern United States. Both *discoidea,* and the closely related *Omosita colon* occur in Europe, over the same range, but in the United States, the former species, as previously recorded, was restricted to the western United States, where it is common, while the latter occurs only in the eastern states. The occurence of but a single specimen of *discoidea* through months of continuous baiting, which yielded thousands of *colon*, one would infer that the species is not common in the east.—CARL GEORGE SIEPMANN, Rahway, N. J.

Serica brunnea L.—In vol. XXVI, p. 176 of this publication I recorded the occurrence of the European *Serica brunnea* from Flushing, Long Island. However, it is not that species but the Japanese *S. similis* Lewis. Mr. R. J. Sim called my attention to the misidentification, having also Long Island specimens but from Westbury, June (Hallock), which he tells me were compared with the type of *similis* by Mr. Arrow. He sent me a specimen of this and also of the European *brunnea* with the genitalia extracted which are entirely different in the two. Both species are very similar, but *similis* has the sides of prothorax very feebly rounded and almost straight from base to apical angles which are also feebly rounded, while in *brunnea* the sides are rather strongly arcuate anteriorly and the anterior angles broadly rounded; the clypeal suture in *similis* is subangulate, in *brunnea* straight; the two claws of the anterior tarsus of the male are alike in *similis*, in the male of *brunnea* unequal, that is, the outer claw is broadly appendiculate, the inner as usual.—CHAS. SCHAEFFER, Brooklyn, N. Y.

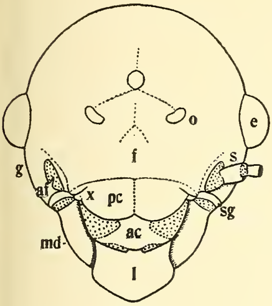


Fig. 1

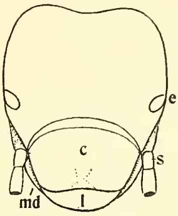


Fig. 2

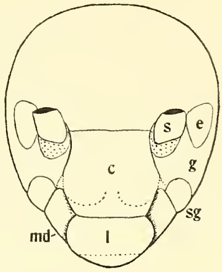


Fig. 3

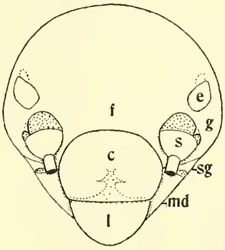


Fig. 4

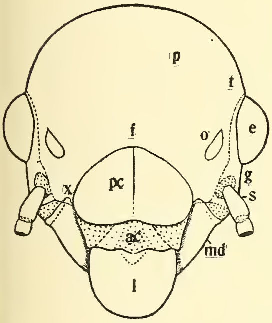


Fig. 5

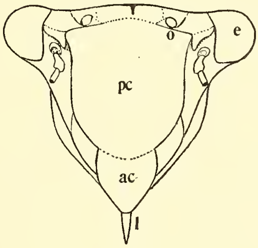


Fig. 6

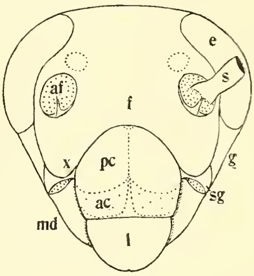


Fig. 7

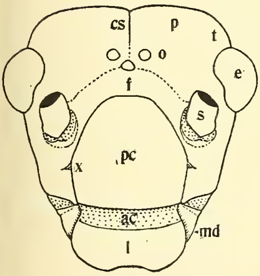


Fig. 8

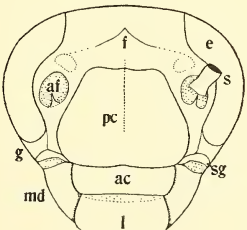


Fig. 9

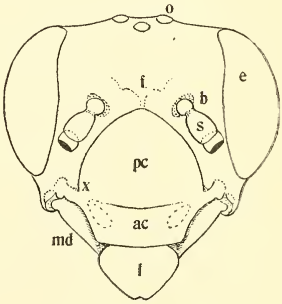


Fig. 10

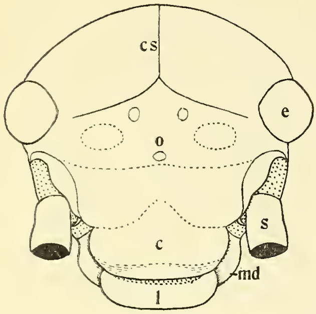


Fig. 11

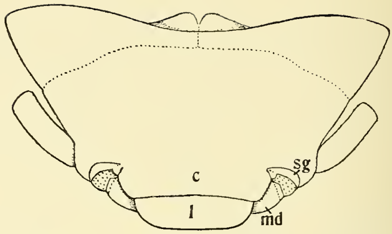


Fig. 12

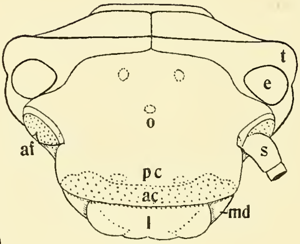


Fig. 13

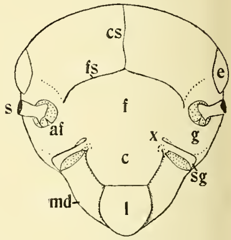


Fig. 14

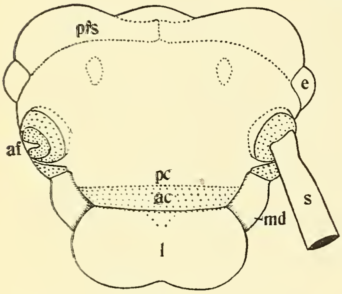


Fig. 15

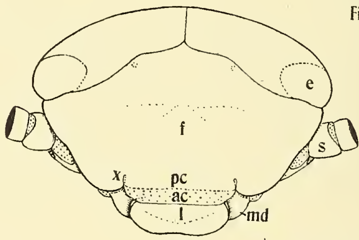


Fig. 16

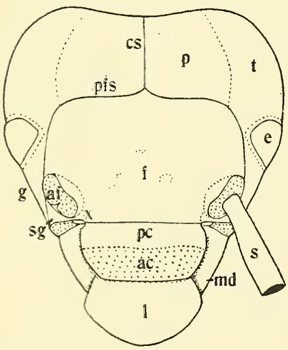


Fig. 17

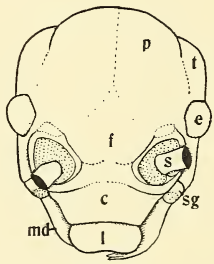


Fig. 18

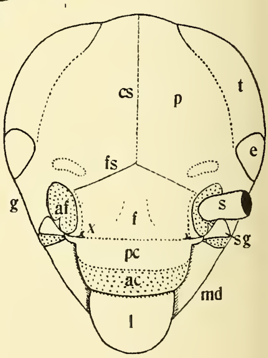


Fig. 19

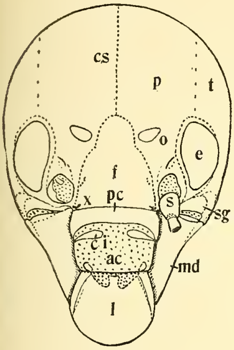


Fig. 20

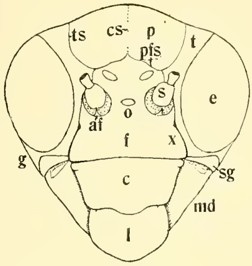


Fig. 21

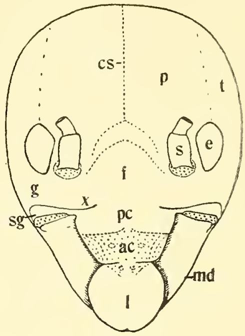


Fig. 22

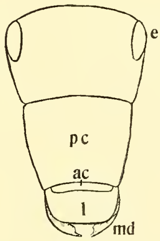


Fig. 23

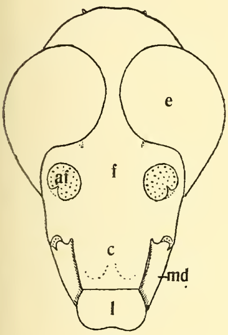


Fig. 24

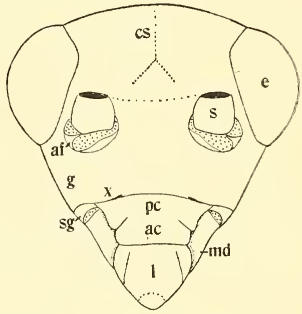


Fig. 25

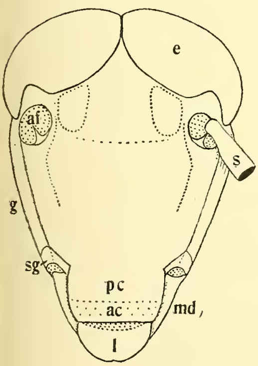


Fig. 26

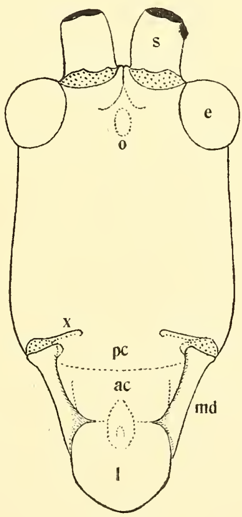


Fig. 27

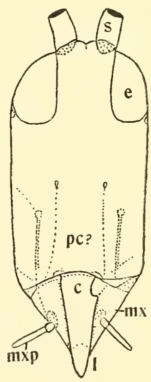


Fig. 28

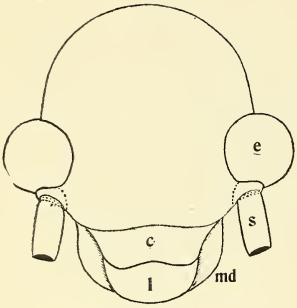


Fig. 29

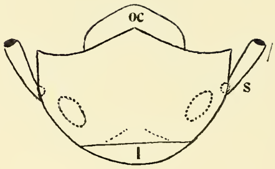


Fig. 30

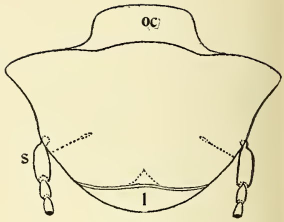


Fig. 31

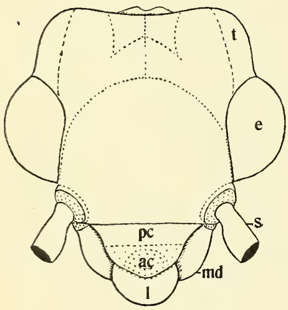


Fig. 32

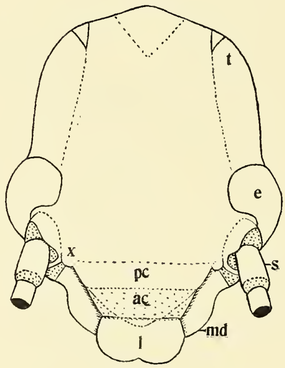


Fig. 33

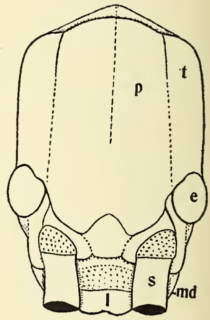


Fig. 34

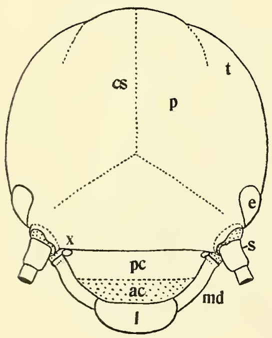


Fig. 35

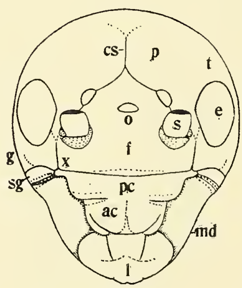


Fig. 36

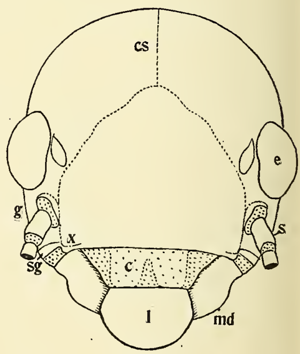


Fig. 37

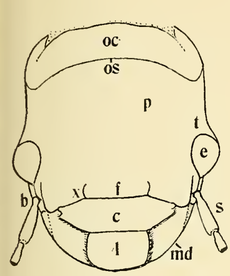


Fig. 38

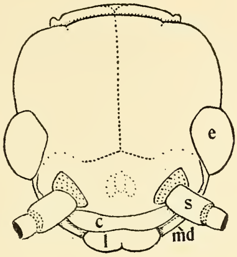


Fig. 39

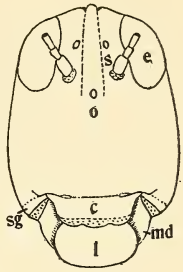


Fig. 40

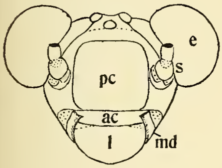


Fig. 41

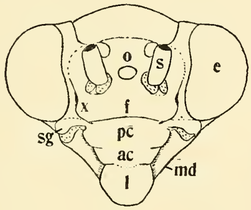


Fig. 42

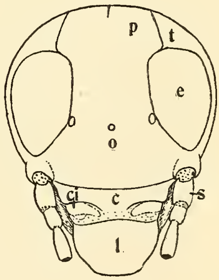


Fig. 43

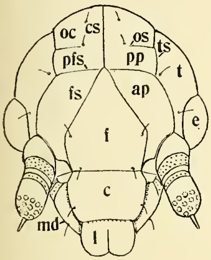


Fig. 44

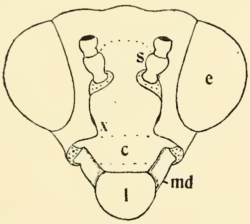


Fig. 45

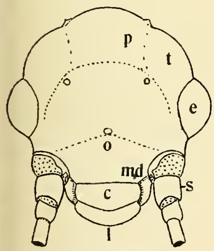


Fig. 46

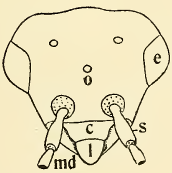


Fig. 47

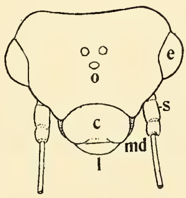


Fig. 48

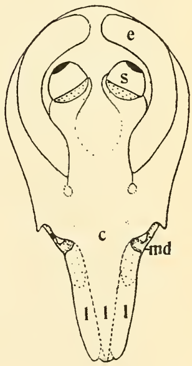


Fig. 49

BÖVING AND CRAIGHEAD'S LARVAE OF COLEOPTERA[1]

By Charles W. Leng, Staten Island Museum.

From the earliest studies of beetles, their larval forms have received the attention of entomologists, and at least as early as 1819, when MacLeay published Horae entomologicae, an effort was made to compare the system of classification then in use with the observed larval characters.

As time went on, the adult characters became better known and, by the assembled studies of many coleopterists, a modified system of classification was developed which I endeavored to present in the introduction to my catalogue of 1920. Meanwhile studies of the larvae, and of the bearing of their characters on the classification, also proceeded. The works of Schiödte (1861–1883) in Denmark, and of Perris (1876) in France, became classics in our literature, and were followed in 1906 by the appearance of Dr. Böving's "Bidrag til Kundskaben om Donaciinlavernes Naturhistorie," made available in 1910 in English and German. The publication of this essay, which in its original form covered 263 pages devoted to the study of the larvae of one small tribe, gave a remarkable impetus to the systematic study of beetle larvae, and earned for its author, then 37 years of age, an international reputation. In 1913 he became associated with the United States National Museum, with its famous coleopterist, the late Dr. E. A. Schwarz, and with the brilliant group of specialists there assembled.

Since 1915, in constant association with these men, and also in touch with European workers, Dr. Böving has patiently elaborated a classification of beetles based on larval characters. By 1920, he tells us, "a general scheme of the classification . . . was drawn up, including the keys to families and family series, and most of the plates were completed." Since that time ten more years have been spent in remodeling the keys, and in introducing keys to subfamilies and lesser groups, besides discarding unsatisfactory figures and preparing new figures. Finally the work under review has been given to the world.

[1] An illustrated synopsis of the principal Larval Forms of the order Coleoptera, by Adam G. Böving and F. C. Craighead, Entomologica Americana, vol. xi, n. s. pp. 1–351, pls. 1–125, 1931.

It consists of a preface, in which generous recognition of the work of his colleagues is found; of an introduction, in which the general types of larvae are designated and the scheme of classification thereof is described; of a synopsis (pp. 9–68), in which the salient characters of the larvae of each family and subfamily are given, followed (pp. 81–338) by 125 plates on which about 2500 figures illustrate the characters used in the synopsis. Throughout the phylogeny of the order, summarized on plate 125, and the bearing of the relationships disclosed, are kept before the reader, footnotes being used copiously for that purpose. It thus constitutes, as described in its title, an illustrated synopsis of the larval forms of Coleoptera, and even more, a system of classification based exclusively on larval characters.

A comparison of this classification with that in use for the adults leads to the gratifying discovery of their similarity, as to which Dr. Böving states "as a rule the classification of the larvae agrees with the commonly recognized classification of the imagines." The main features of both are the primary division of the order Coleoptera into suborders, which in turn are divided into a number of series; the differences are found principally in the number and composition of these series.

To recite or much less to criticize these differences is not the purpose of this review; indeed it seems probable that changes in the classification of the adults must result from following the valuable clues afforded by the larval characters. But it may be of interest to indicate a few of the changes indicated as necessary.

The primary division adopted by Dr. Böving is three-fold instead of two-fold. The Archostemata, as well as the Adephaga and Polyphaga, are recognized as of subordinal rank. This course, favored by Kolbe, is endorsed by Forbes on the basis of venation and wing folding pattern.

The Rhysodidae, a family of which the position has long been in dispute, are definitely placed in the series Caraboidea of the Adephaga.

In the Polyphaga the number of the series has been reduced by several consolidations. Dr. Böving finds three types of larvae in the Polyphaga, of which one styled the leptinoid-staphylinoid is the most primitive. The series whose larvae are of this type are Staphylinoidea (including Silphoidea) and Hydrophiloidea. The latter series includes, as one of its families, the Histeridae. Inasmuch as the studies of Forbes and of Tillyard emphasize the isolation of this family, its relationship as indicated by larval characters is remarkable.

The second type of larvae is styled cucujoid; it includes as a single series Cucujoidea a large number of clavicorn families, and a great part of the old heteromerous families. From phylogenetic point of view its most primitive member is the genus *Eucinetus,* its most derivative members the numerous families and subfamilies allied to Tenebrionidae.

The third type of larvae is named byrrhoid and includes the remainder of the Coleoptera, divided into several series, and culminating in the so-called phytophagous series, the Cerambycidae, Chrysomelidae, and Rhynchophora. From the byrrhoid type, three subdivisions are traced, one leading through the Dascilloidea to Scarabaeoidea, another through the Dryopoidea to the Cantharoidea and Elateroidea, and the third through the Cleroidea to the Meloidea and the Phytophaga. By the recognition of these larval types, the main features of our classification based on adult characters are confirmed, while the position of the doubtful or disputed groups is more clearly indicated.

Without going further into the changes indicated as necessary, it is evident that Dr. Böving's contribution to the classification of the Coleoptera is of supreme importance, the outcome of a lifetime of study and one that must hereafter profoundly influence all future studies of the classification.

It should be added that the publication committee of the Brooklyn Entomological Society are to be congratulated on being the medium through which Dr. Böving's work is communicated to the public, and upon the excellent manner in which they and the Science Press have presented it. To the older members of the Society, it must be gratifying that the early attempts of Schaupp to illustrate beetle larvae in the Bulletin should be thus followed, fifty years later, by Dr. Böving's comprehensive treatment of the larval forms of the Coleoptera.

THE COURTSHIP DANCE AND SLEEPING HABITS OF SCOLIA DUBIA.

By Phil Rau, Kirkwood, Mo.

A colony of these wasps was discovered in late summer on a city lot. Previous experience had led us to expect these insects only in the latter part of August.[1] They were actively flying about a neighborhood dump where rotting vegetation, barn refuse, tin cans and broken pottery lay in rank heaps. This dump was in a thirty-acre field, but a careful check showed wasps in only this one spot, a space of about a dozen square yards. Obviously, the decaying matter contained their hosts. A superficial scratching of this pile revealed thousands of larval green June beetles, *Cotinus nitida.* These were at various depths in the heaps, and often a round hole in the manure led to a larva. In June many adult beetles had been seen flying about these heaps, but were not seen elsewhere in the field. Now if these back-crawler larvae were the prey of the wasps, the latter could hardly have come earlier and gotten prey sufficiently large to feed their young.

The surfaces of some of the piles were heaving like ocean waves; a slight kick with the foot at such places would expose dozens of surprised larvae. About these mounds hovered many low-flying *S. dubia* wasps, conspicuous by their red, yellow and black abdomens. During the early part of their lives, this low flight was a courtship dance in which both sexes took part. On September 3, a rainy morning, this courtship dance was observed from 8 to 10 a. m. Six adjacent mounds of manure and rubbish were their chosen "dance platforms." There were by this time (about four days after their first appearance) about 150 wasps scattered over the small area. Possibly the females had come upon the scene suddenly, a little later than the males, as happens in many species of wasps. I was unable to distinguish the sexes at a glance when they were young.

The slow flight was performed in a horizontal plane three or four inches, and never more than twelve inches, above the ground. They glided smoothly in and out the maze, wheeling in figures S's and 8's for hours at a time. Presently one of them would leave the flight, alight on the mound, fold her black wings

[1] Wasp Studies Afield, pp. 129–132, 1918.

over her bright abdomen and immediately become inconspicuous against the dark background. Thus they rested quietly, often for several minutes, while the dance went merrily on over their heads. Suddenly the one resting would spread the black wings wide open, revealing the brilliantly colored body, and almost immediately one of several would swoop down from the dance and attempt or consummate a mating. The union is almost instantaneous, although it may be prolonged by the confusion. In the majority of cases, the visitor merely bumped the resting one; approximately fifty bumps occurred to one actual mating. I do not know if they were unable to distinguish the opposite sex from a short distance, or if these attempts were merely a part of the courtship play. No such behavior occurred while they were on the wing, but the display of color of the resting wasps seemed unfailingly to elicit this reaction. It seemed that this spreading of the wings was no mere accident. One would almost say, to see the process, that it was deliberately and coquettishly done. When the wasp alighted, with the wings closed and the bright colors hidden, the creature was almost invisible. After a few minutes, the wings were slowly spread apart and it appeared that the wasp was preparing for flight into the air. In that, we were deluded, however, for with her wings spread, she would quietly sit and wait, but for only a brief time. So attuned were they to the expectation of being attacked while resting with the wings open that they would not move at the approach of one's fingers or forceps, and they could be picked up by the dozens without difficulty. So great was their expectation that one could approach quickly or slowly, dangle the forceps above them and give them ample warning without arousing them to the least response.

A week later, the wasps were still more numerous, and they were behaving about the mounds in the same way. The excess population were even going through the maneuvers along the pathway near the mounds. From early morning until late afternoon they danced, and matings occurred more frequently with rivalry among the males. By this time the large size of the abdomens of the females indicated that the ova were reaching maturity and soon egg-laying would begin.

During this courtship period, both sexes slept on the plants near-by, but later in their lives, they crept into the earth under the rubbish to spend the night. They were up bright and early on pleasant days, but on cloudy days they often remained in sleep until a late hour. One rainy morning, they were observed to sleep until 10.30 a. m. Sometimes they were alone on the vegetation, but more frequently they were in groups of from two to ten or even twenty, huddled together irregularly among the unripe seed-clusters of lamb's-quarter. In the center of one such group of ten, one wasp, *Prionouyx atratum,* was found fast asleep. When *Scolia dubia* slept, she did not assume the pose common among *Ammophila* wasps (clinging to the stem with the mandibles, with the body horizontal and legs hanging free), but she lightly rested with all six feet on the surface.

The most interesting point in this sleeping behavior is that there seemed to be a clear-cut dividing line in their choice of sleeping quarters, probably determined by the ending of courtship and mating. In early life they slept in the vegetation; after mating they crept into the manure-heaps. This was not due merely to the colder weather in the later period, because in cages in the house they behaved in the same way. Twenty wasps kept in cages climbed over the leaves and sipped honey during the day, but at night all crept under the earth at the bottom of the cage. In one cage with a wooden bottom, they always crept under a scrap of paper on the floor. September 12 seemed near the dividing line between their juvenile and adult life.

On September 18, when the place was again visited, only about a dozen *Scolia* were to be seen above the mounds, and their demeanor was entirely different. They nervously walked about, occasionally stopping to examine a clod, and soon entered the ground head first and disappeared from view. Just below the surface were hundreds of beetle larvae, but most of them were active, and on the quiet ones I failed to find any wasp eggs. For several days thereafter the spot was watched, and the wasps continued to come, in small numbers, until September 23.

Fabre succeeded in getting *Scolia* wasps to sting the beetle larvae in the confines of a bell-jar. Of the many that I placed in cages, only one wasp stung the larva, and this seemed only the result of being irritated, because it got in her way. The writhing of the larva caused the wasp to turn somersaults while she was clinging to her prey, and finally she turned it over and stung it under the mouth. A large drop of black juice oozed out at the point of the sting, and the larva stretched out as if dead, but it subsequently passed pellets of excrement and the next day it moved the legs feebly. Probably the reason I did not get so abundant a stinging response, as did Fabre, was that the date of my experiments did not coincide with the period of oviposition, when the wasp would have been in psychological as well as physiological condition for this reaction.

KOW-TOWING TO THE GENERAL ZOOLOGIST.

By J. D. Gunder, Pasadena, Calif.

Being the first of a series of short illustrated articles upon subjects of interest to entomologists, we introduce to you, for convenience of portrayal and interpretation, our personified character, Dr. TOM, otherwise known as Dr. E. N. TOM OLOGY. Dr. Tom may represent you or me or all entomologists in general, but we leave that to the discretion of the majority.

In the picture opposite Dr. Tom thinks that our science, Entomology, is getting " growed-up " and that in the future we should have more representation in Zoölogical circles, more than we have at present. In fact he is tired of " kow-towing " and he has heard it hinted that the book of " Rules " should be revised to take more recognized cognizance of the scientific findings in the world of the insects. But the trouble is that some folks think that insects won't ever go well with jellyfish and elephants. Maybe they are right—under the present conglomerate régime. Is it possible that united entomological groups may eventually have to " cut certain foreign fetters " and have separate rules? In the meantime Dr. Tom should make an effort to use the "committee wand," if opportunity presents. Did you notice the short and evidently impromptu note upon entomological kowtowing by H. J. Turner in the May, 1931, Record and Journal of Variation, page 91? Of late years there seems to be something radically right with some of our beloved radicals. That's a friendly pat on the back! But the question still remains—Is it possible in this age of specialization to rejuvenate for future need an authority which specialization is making antiquated?

Kow-towing to the General Zoölogist—Gunder

(*Text on opposite page*)

EUROPEAN EXCURSIONS FOR ENTOMOLOGISTS IN 1932.

American Entomologists who attend the Fifth International Entomological Congress and the Centenary of the French Entomological Society, in Paris, July 16–23, 1932, will doubtless take advantage of the occasion to visit other parts of Europe.

A joint committee was appointed in December, 1930, by the Entomological Society of America and by the Association of Economic Entomologists to arrange for transportation. In addition to providing for those going directly to the Congress, the arrangements of the Committee include two cooperative excursions through Europe at very moderate costs. While intended primarily for entomologists and their families and friends, others, up to certain limits, will be welcome.

Agreements between north Atlantic steamship companies prevent any actual reduction of the rates for ocean transport, but those going in the groups will be given superior accommodations. Furthermore, the Committee will be glad to accord to any one, whether going as a member of one of the groups or independently, the privilege of sharing in very favorable arrangements that have been made covering transportation in Europe and which will amount to a substantial saving of expense. In order to secure such benefit, reservations for ocean transportation should be made through the Committee.

The first group will sail from New York on the *Leviathan,* June 11, visiting (among other places) Copenhagen, the Gota Canal in Sweden, which will be partly traversed on midsummer night when all the village folk hold festival and dance all night in the open air, Stockholm, Upsala, the summer home of Linnaeus at Hammarby, and thence by rail northward to the Swedish National Park in Lappland where a stay of some days will be made on the arctic tundra at Abisko with views of the midnight sun. Those who wish will have time to continue by excursion steamer to the North Cape and back. Returning to the Continent, some days will be spent in Holland and Belgium before going to Paris for the Congress. After that event there will be a week's excursion in the Pyrenees, arranged by the French local committee of the Congress. Then Avignon will be visited, with an excursion to Orange and the home of Fabre at Serignan. Continuing to Grenoble, the party will traverse the Savoyan Alps by motor coach to Argentières at the foot of Mount Blanc, and after some days continue by motor coach to St. Jeanne de Maurienne, and thence into Italy, where Turin, Genoa, Pisa, Naples, Rome, Assissi, Perugia, Florence, Bologna, and Venice will each be visited. Continuing over the Brenner Pass, a short stay will be made on the Eibsee in the Bavarian Alps, with opportunity to ascend the Zugspitze, Germany's highest peak. Munich, and the three beautifully preserved medieval cities Dinkelsbühl, Rothenburg, and Nuremburg will be visited, Leipzig during the autumn fair, Dresden, the Spreewald, and Berlin. After a final few days in England the party will sail for home September 17 from Southampton. Expenses estimated at about $800.

The second group will sail from New York on the *Olympic* July 1, joining the first group in Holland and remaining with them until the Alps. Thereafter they will omit Italy, and make a somewhat swifter tour of Germany, with also a few days in England before sailing, August 27, on the luxurious new liner *Manhattan*. Expenses about $550.

Those wishing to go directly to the Congress at the last moment will sail on the *Majestic* July 8. Estimated expenses, including twelve days in Paris, about $325. Combinations of portions of the tours can also be arranged. While many of the points to be visited have been selected because of their importance as entomological centers, all are full of interest from other points of view for the general traveler.

Estimates are based upon tourist class (former second class) at sea, second-class railway, unpretentious but thoroughly comfortable and clean hotels, and inexpensive restaurants, with an allowance for side-trips, incidental and personal expenses. They have been kept as low as possible, consistent with comfort, in order to make the trips available for students of limited means, who may look upon them as part of their educational equipment.

Reservations should be made at the earliest date possible. For circulars and information address: O. A. Johannsen, Chairman, Joint Committee of the Entomological Society of America and Association of Economic Entomologists on Transportation to Europe, Roberts Hall, Ithaca, New York.

BOOK NOTES.

The Butterfly Book—New and Thoroughly Revised Edition—by Dr. W. J. Holland. Pp. I–XII + 1–424, plates I–LXXVI, figs. 1–198. (Doubleday, Doran & Co., Inc., New York, 1931. Price, $10.00.)

The service and stimulation to entomologists and nature lovers in general given by The Butterfly Book, First Edition, is amply shown by the sale of over 65,000 copies since its publication in 1898. For some years this book has been out of print and the few available copies in the hands of dealers instead of the original price of $5 have been held at premiums double and triple that amount.

The new and thoroughly revised edition recently released from press and selling at $10 undoubtedly and deservedly will enjoy in an increased measure the popularity of its predecessor. About 700 species and several hundred varieties of butterflies known at present in the North American Continent from the Arctic regions to the Gulf of Mexico have been sufficiently well covered and illustrated to render the book a complete illustrated manual on its subject. This is more than has been accomplished for any other Order of insects in America. Dedicating this revised edition to "My scientific friends throughout the World," Dr. W. J. Holland, now in his eighty-third year states in his preface that the book is his farewell offering to the rising generation of entomologists. To the eminent author it will stand as a lasting monument to his accomplishments.

The introduction of the book, pp. 3–60, has called for important changes from the first edition. As heretofore, it deals with the life-history and anatomy of butterflies; the capture, preparation and preservation of specimens; the classification of and books about North American butterflies. These chapters are treated concisely yet adequately and serve as a practical foundation for any one starting a collection. Three hundred and sixty-three pages, including the index, have been devoted to the text, enumerating the families, genera and species. A division of some of the families into sub-families, sub-genera and subspecies has been adopted.

Extensive descriptions were uncalled for in view of the wealth of magnificent illustrations. In addition to the numerous helpful pen-and-ink drawings of wing-venation interpolated in the text, there are 76 full-page illustrations, 73 of which are colored and 3 line drawings. These with the exception of Plate I as a frontispiece follow at the end of the book.

To the fraternity of entomologists, Holland's revised Butterfly Book is indispensable; to nature lovers it will continue to be an inspiration.

GEORGE P. ENGELHARDT.

Stylops—A Journal of Taxonomic Entomology—We have just received the first issue—Vol. I, Part 1—of this new English publication of the Entomological Society of London. Its purpose is set forth in the first paragraph of the Notice: "This Journal is primarily designed to meet the demand for the prompt publication of short taxonomic papers. For this reason, papers exceeding 10,000 words, or occupying more than 12 pages cannot be accepted for it, and preference will be given to appreciably shorter communications."

This first number is dated on the cover January 15, 1932; and the price per part is set at 3 shillings, or 24 shillings per year. It will run, presumably, to 8 or 10 numbers to the year. The price for United States subscriptions is set at $6. annually. However, the date as set in the number might not appear to indicate that it will be published at stated intervals.

This part has 24 pages, 7¾ x 4⅝ inch, set in 8 and 10 point size, condensed, the type looking like our American Scotch Roman. It will accordingly carry as much matter as one of our journals carries in 32 pages. Obviously, its complete volumes with parts containing this number (24) of pages will be equivalent in content to a 320 page volume of our own publications. The price, however, is twice as great as that of any American publication of a similar character.

The part before us carries six papers from 2 to 8 pages in length, one each on Coleoptera, Hymenoptera, Diptera, Lepidoptera, Homoptera and Nycteribiidae, all on faunas foreign to Great Britain.

We wish its Editor, Dr. S. A. Neave, and its publisher, the Entomological Society of London, as great a success and future for this new publication as those of their century-old Transactions.

J. R. T.-B.

PROCEEDINGS OF THE SOCIETY

Minutes of Meeting of November 12, 1931

A regular meeting of the Brooklyn Entomological Society was held in the Brooklyn Museum at 8.15 p. m., November 12, 1931, Vice President Torre-Bueno in the chair, and the following members present:

Engelhardt, Sever, Wurster, Shoemaker, Schaeffer, Moennich, Wilford, Eisenhardt; also Dr. Crosby of Cornell, Mr. C. L. Pollard, and one other visitor, Hugo Cleff.

In the absence of the Secretary, Mr. Pollard was appointed to serve as Secretary pro tem. Minutes of the last regular meeting were read and approved.

The Treasurer reported progress, and the Chair, speaking for the Publication Committee, reported that material for the first number of Volume 12 of Entomologica Americana was in hand, consisting of a paper by Dr. Ball on the Telamoninae, a tribe of tree hoppers. Another paper was on hand, by Dr. Klotz, on Lepidoptera. Dr. Becquart also promised a paper on Hymenoptera. The Bulletin would appear next month. Both reports were received and ordered placed on file.

The name of Mr. Hugo Cleff, 8789 102 Road, Ozone Park, Long Island, was proposed for membership. On motion, duly carried, the by-laws were suspended, and the Secretary was directed to cast an affirmative vote of the Society for Mr. Cleff.

A letter was read from the librarian of Science Service requesting to be furnished with the membership list of the Society and copies of its publications. On motion the Secretary was directed to advise her that the membership was contained in the list of membership of the New York Academy of Sciences and affiliated Societies.

Mr. Engelhardt announced the death of Charles Ahlund, a member of the Society, and offered the following resolution, which was adopted unanimously:

"The announcement of the death of Charles Ahlund, on October 18, 1931, was received with deep felt regret at the meeting of the Brooklyn Entomological Society held on November 12, 1931. By unanimous vote it was resolved that the loss of so promising and well liked a young member be recorded in the minutes of the Society, and that an expression of the genuine sorrow of all the members should be sent to Mrs. Bertha Ahlund, mother of the deceased."

The scientific program was then taken up, and Mr. Shoemaker, under the heading of general notes, referred to his collecting experiences in Washington, D. C., with Mr. Nicolay, and stated that he had obtained *Dicaelus sculptilis,* a carabid beetle, for the first time in that locality.

Mr. Engelhardt then presented the communication of the evening, entitled "With William T. Davis across the continent."

At 10.30 the Society adjourned.—C. L. Pollard, Secretary pro tem.

Meeting of December 10, 1931

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, December 10, 1931, at 8.15 p. m.

President Davis in the Chair and 16 other members present. viz., Messrs Anderson, Ballou, Bell, Burke, Cooper, Cleff, Eisenhardt, Engelhardt, Glanz, Lemmer, Lerch, Moennich, Schaeffer, Sheridan, Siepmann, Torre-Bueno and two visitors, including Mr. Stecher.

The minutes of the previous meeting were read and approved. Mr. Engelhardt reported for the treasurer, saying that the society was in a position to meet all of its current obligations.

Mr. Torre-Bueno reported for the publication committee, stating that the October Bulletin was out, and that the December number was in the printer's hands, the galley proof being expected any day. Mr. Torre-Bueno appealed to the members of the society to contribute short notes of entomological interest for the Bulletin which could be placed on the half pages or so that remain at the end of the longer articles, which start at the top of a new page.

Mr. Engelhardt read a letter he received from Miss Louise Knobel, of Hope, Arkansas, a professional collector. She obtained most of her material at trap lights and her list included a number of desirable Lepidoptera. He read another communication from Mrs. Leslie D. Beadle, 219 Elmer Street, Platteville, Wisconsin, referring to a large collection for sale by the estate of a deceased entomologist, whose name was not given. The collection had an especially good series of Catocala, and any order or family would be sold separately.

Mr. Engelhardt then spoke of the coming International Congress of Entomology, to take place next July, in Paris, France. A comprehensive European tour has been planned, covering most oof the countries of Europe, at a reasonable cost, for American entomologists who expected to attend the meeting.

Mr. Torre-Bueno added that since next year would also be the one hundredth anniversary of the founding of the Entomological Society of France, our society ought to send some sort of formal greetings, and that the members of the society who attend the meeting in Paris could be appointed by the society to represent them as official delegates.

Mr. Davis suggested that the society give the matter further attention at a later meeting.

A copy of the "New Butterfly Book" by Dr. Holland was exhibited by Mr. Engelhardt. This new edition is excellently illustrated, with 76 full page plates, all but three of which are colored, and numerous pen and ink cuts in the text.

Mr. Torre-Bueno exhibited a number of books, including: "Common Pests," by Dr. Doane, of Stanford University, concerning birds as well as insects; "Dictionary of Greek and Latin Combining Forms" published by C. A. Thomas; a brief presentation on the subject of "Social Behaviour in Insects" by Dr. A. D. Imms, published by the Dial Press; "Text Book of Agricultural Entomology" by Kenneth M. Smith, the first textbook on the subject published in England for a number of years, and "The Fabrician Types of Insects in the Hunterian Collection at Glasgow University" by Robert A. Staig, which contains many colored plates and rediscriptions of Fabrician types, including some American species, drawn from the extant types.

Mr. Davis appointed a nominating committee to consist of Messrs. Schaeffer, Lemmer, and Wilford.

Mr. Engelhardt reported seeing in Hartsdale, N. Y., a large number of wingless females of *Alsophila pometaria,* the Fall Canker Worm, on a wooden fence rail, a short time before the meeting, and said he expected a heavy infestation of this species next year. It was on account of this species that the English Sparrow was introduced to America.

Mr. Siepmann exhibited a specimen of *Serica brunnea,* taken at Hempstead, Long Island, that he had received from Mr. Ballou. This is the newly introduced European species Mr. Schaeffer recorded at a previous meeting.

Mr. Cooper reported that he had collected some insects at Darts, New York, during the past July and August, obtaining about 500 specimens of a minute Ptilid, possibly an undescribed *Mycophagus,* on *Polyporus* fungus. He also exhibited a series of the earwig, *Doru aculeatum,* showing the malformation of anal forceps. Only four such abnormalities were noted in a series of sixty-three specimens. The exhibited contained normal specimens of each sex, the four abnormal specimens, and pen and ink drawings explaining the malformation.

Mr. Davis spoke on his trip to the Pacific Coast during the past summer in company with Mr. Engelhardt. He illustrated his talk with a large series of photographs. Glenwood Springs, Colorado, remarkable for its luxuriant growth of dandelions, was one of the first places at which the party stopped. From there they went through Colorado, Utah and Nevada, crossing the dismal alkaline deserts in the latter states, and thence into California. Mr. Davis mentioned that the Californian mountains were very different from those of the eastern states, being set close together with deep, narrow valleys separating them. Large trees which were really timber grew on the slopes, with here and there a tall white yucca. Going southward, Palm Springs and Indio were reached, the latter locality being twenty or thirty feet below sea level. The return trip was made by way of Texas, stopping at Alpine, and ascending the nearby Miter peak. This mountain is of unusually symmetrical form, but its summit does not afford a very large area for collecting; however, large numbers of ladybird beetles were noted there. Passing by the Chisos Mountains, forbidding piles of red rocks, to San Antonio, Texas, the party continued eastward.

Mr. Davis exhibited several boxes of Cicadas collected during the Western trip and stated that eighteen species had been found. At Indio, California, on the morning of June 21 a great many *Diceropricta apache* were found beneath some cotton-wood trees, either dead or in a dying condition. They had reached the end of their days. Most of them were of the pale brown variety, but a few were dark chocolate colored or almost black. Later other examples of this species were collected at Buckeye, Arizona. At Salton Sea the pale colored *Okanagodes gracilis* was found in numbers bordering the lake. They were singing vociferously for so small an insect, and were easily collected. In the Davis Mountains, Texas, and again the Chisos Mountains, *Tibicen inauditus* and *Cicada chisos* were found, often in the same oaks and other trees. *Inauditus* is easily collected and may be picked from the branch on which it is resting, while *chisos* is far more shy. *Tibicen tigrina* which resembles *inauditus,* and also the beautiful green *Tibicen superba,* were found in Landa Park, New Brunfels, Texas. Still further east *Tibicen similaris* was not uncommon in Mississippi and Alabama.

The meeting adjourned at 10:15 p. m.—Carl Geo. Siepmann, Secretary.

On the Occurrence of Neoharmonia venusta in New Jersey (*Coleoptera-Coccinellidae*)—Only one record of this species occurs in the New Jersey State List, which is from the washup at Atlantic City. An additional record (Bulletin Brooklyn Entomological Society, vol. XXII, p. 178; minutes for meeting of December 16, 1926), was that of a single specimen taken by myself beneath bark at Rahway, N. J. No additional specimens were taken in the succeeding years, although I frequently collected in the immediate vicinity, both beneath bark, and on willows. From this it would seem that the species is not common in the state. However, on August 16, 1931 a good series of the species was obtained from the foliage of the willows overhanging the Delaware River near Holland, N. J., and more specimens could easily have been taken. This is the only record of this species occurring in numbers in New Jersey.—Carl George Siepmann, Rahway, N. J.

Vol. XXVII APRIL, 1932 No. 2

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

BROOKLYN ENTOMOLOGICAL SOCIETY
1872

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, Editor

CARL GEO. SIEPMAN GEO. P. ENGELHARDT

Published for the Society by the
Science Press Printing Co.,
Lime and Green Sts., Lancaster, Pa.,

Price, 60 cents Subscription, $2.50 per year

Mailed May 31, 1932

Entered as second-class matter January 21, 1919, at the post office at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

CONTENTS

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $2.50 per year; foreign, $2.75 in advance; single copies, 60 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE–BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXVII   April, 1932   No. 2

THE MORE IMPORTANT CLIMBING CUTWORMS.

By S. E. Crumb, U. S. Bureau of Entomology, Puyallup, Washington.

The term " climbing cutworm " is applied to those larvae which feed upon shrubs and trees, and normally spend the day in concealment on the ground. A great many species of larvae have this habit but the thirty species here described include all of these which have ever assumed importance as pests, in so far as the writer is aware, with the exception of *Polia subjuncta.*

Slingerland (5)[1] described and figured five species of climbing cutworms; Franklin (1) added figures and descriptions of six species; and Phipps (3, 4) has published data on twenty-six species with figures of twelve. Numerous additional references to climbing cutworms are scattered through the literature.

The following procedure is suggested in identifying larvae: Determine under a low power of the compound microscope whether the skin appears nearly or quite structureless, when it is said to be smooth, or whether definite structural units are visible, in which case the skin is said to be granulose; measure the basal width and height of the front (Pl. X, fig. D) and the length of the median line above the apex of the front with an ocular micrometer, taking these measurements as nearly as possible with the line of sight at right angles to the part to be measured; determine the position of setigerous tubercle O[1] (Pl. X, fig. 1) with regard to whether it is upon or posterior to a line which would connect the centers of ocelli IV and VI, and examine the inner (oral) face of the mandible, by inserting a scalpel or other thin object beneath the middle of the toothed margin and turning the mandible out-

[1] Numbers in parentheses refer to the list under " Literature cited."

ward, to determine if a process or tooth is present on the first ventral rib (Pl. XI, fig. H). With this information committed to paper it should be possible to trace the larva quickly through the main divisions of the key, after which the specific determination usually can be made on characters which are readily seen.

The proportions of the front and length of the median line are somewhat variable, but probably never sufficiently variable to interfere with the correct determination of species as used in the key, and in occasional specimens the mandibular process may be entirely absent in species in which this process is normally present. It is best to examine several specimens in doubtful cases.

The writer wishes to express his appreciation of the kindness of several individuals who have furnished specimens upon which descriptions are based, as indicated herewith: Dr. J. McDunnough and H. F. Hudson, *Euxoa scandens*; C. R. Phipps, *Drasteria graphica atlantica*; Dr. H. J. Franklin, *Xylena nupera*; J. H. Hawkins, *Agrotis phyllophora* and *Polia purpurissata*; Dr. Harold Morrison and Carl Heinrich, *Homohadena badistriga*; A. R. Rolfs, *Lampra placida*.

A Key to the More Important Climbing Cutworms.

1. Prolegs absent on third abdominal segment and much reduced on fourth. Six pairs of setae ventrad of the spiracle on abdominal segment one. Setigerous tubercle VIII (the midventral pair) on abdominal segments one and two spiracle-like, without a seta (Pl. X, fig. G). Spinneret about five times as long as the labial palpus.
Drasteria graphica Hübner

   Prolegs present on third abdominal segment. But five pairs of setae ventrad of the spiracle on abdominal segment one. Setigerous tubercle VIII normal with a setae (Pl. X, Fig. H). Spinneret at most not much longer than the labial palpus (Pl. X, Fig. E) 2

2. Length of median line of head above apex of front equal to not more than one-third the height of the front. Adfrontal sutures terminating dorsally in or very near the apex of the occipital foramen. Skin granulose 3

   Length of median line of head above apex of front not less than one-half the height of the front. Adfrontal sutures terminating dorsally decidedly anterior to the apex of the occipital foramen. Skin usually smooth 10

3. Skin pavement granulose. Setigerous tubercle II distinctly larger than I. Pigment reticulation of head replaced entirely by brownish or dark freckles 4

Skin with coarse, isolated granules. Setigerous tubercle I nearly or quite as large as II. Head with pigment reticulation and without freckles.

Feltia ducens Walker
Feltia subgothica Haworth

4. Base of leg claw broadly rounded, not at all angulate (Pl. X, Fig. B). Each anterior proleg in mature larva with about sixteen to twenty-five crochets 5

Base of leg claw normally acutely angulate (Pl. X, Fig. C). Each anterior proleg in mature larva with about six to fourteen crochets 6

5. Middle coxae nearly or quite touching (Pl. XI, Fig. D). Spiracles elevated and slightly emarginate at ends (Pl. XI, Fig. C).

Porosagrotis vetusta Walker

Middle coxae distinctly separated (Pl. XI, Fig. E). Spiracles not elevated nor emarginate at ends (Pl. XI, Fig. B).

Euxoa scandens Riley

6. Freckles on head pale fuscous or brownish. Setigerous tubercle II about three times as large as I (Pl. X, Fig. A).

Chorizagrotis auxiliaris Grote

Freckles on head dark fuscous or black. Setigerous tubercle II about twice as large as I 7

7. Middle coxae nearly or quite touching (Pl. XI, Fig. D). Head but slightly suffused with fuscous dorso-laterally. Markings centering upon the ocelli composed of distinctly separate spots.

Euxoa messoria Harris

Middle coxae distinctly separated (Pl. XI, Fig. E). Head heavily suffused with fuscous dorso-laterally. Markings centering upon the ocelli stripe-like.

Euxoa tessellata Harris

8. Each mandible with about nine distinct teeth. Head set medially with coarse, polished, convex round granules resembling minute ocelli.

Homohadena badistriga Grote

Each mandible with four or five teeth. Granules on head, when present, not as above 9

9. Skin smooth. Dorsal setigerous tubercles very small or minute 8

Skin granulose. Dorsal setigerous tubercles moderately large 22

10. All setigerous tubercles on venter of abdominal segments one and two surrounded by a small but distinct dark pig-

mented area. Basal width of front often greater than its height 11

Setigerous tubercles on venter of abdominal segments one and two consisting merely of a slender chitinous ring not surrounded by a dark area. Basal width of the front never greater than its height (Pl. X, Fig. D) 27

11. Third (apical) segment of labial palpus as long as basal segment (Pl. X, Fig. E). Setigerous tubercle O^1 (Pl. X, Fig. I) on or anterior to a line which would connect the centers of ocelli IV and VI, the tubercle somewhat removed from ocellus IV. Dark subdorsal spots on abdominal segment eight angulate on their dorsal face and hence broadest about midway of their length 25

Third segment of labial palpus less than half as long as the basal segment. Setigerous tubercle O^1 posterior to a line which would connect the centers of ocelli IV and VI, the tubercle very close to ocellus IV. Dark subdorsal spots on abdominal segment eight absent or broadest posteriorly.12

12. Spiracles entirely black. Dorsal setigerous tubercles small but distinct. Occipital angle decidedly acute. No process on base or first ventral rib of mandible. Median line of head above apex of front unusually short 13

Spiracles pale or pale brownish except in *phyllophora* in which the median line of the head is very long. Dorsal setigerous tubercles minute. Occipital angle moderately acute or approaching a right angle. A process usually present on base or first ventral rib of mandible (Pl. XI, Fig. H) 14

13. Black submedian arcs of head confluent above the apex of the black front. Reticulation of head replaced by dark freckles. Cervical shield black except for pale longitudinal lines. No pale middorsal dots on abdominal segments. A V-shaped impressed figure anterior to each pair of prolegs except the anal. Tip of spinneret with a large acute notch.
Agrotis fennica Tauscher

Black submedian arcs of head with a reticulate area between them above the apex of the pale front. Head without freckles. Cervical shield pale with brown pigment reticulation. A pale or orange middorsal dot on each abdominal segment, at least anteriorly. No V-shaped impression anterior to the prolegs. Tip of spinneret produced in setiform processes.
Lycophotia saucia Hübner

14. Length of median line of head above apex of front much greater than height of front. Spiracles dark brown or

black. A narrow but strong and continuous middorsal pale stripe.

Agrotis phyllophora Grote

Length of median line of head equal to or less than height of front. Spiracles pale or pale brownish. A pale middorsal line 15

15. Mandible without a process at base or on first ventral rib. Black subdorsal markings bordered ventrally by a broad, continuous line or stripe, tending to be well developed on all of the posterior abdominal segments, except on eight in *brunneicollis* 16

Mandible normally with a process on base or first ventral rib (Pl. XI, Fig. H). Black subdorsal markings bordered laterally by a slender, broken pale line, tending to be well developed on abdominal segments seven and eight only and including setigerous tubercle I on these segments only, if at all 17

16. Middle coxae distinctly separated (Pl. XI, Fig. E). Black subdorsal markings with an angular extension which includes setigerous tubercle I, markings strong on abdominal segment eight. An oval or V-shaped median area anterior to the prolegs on abdominal segments five and six bounded by small impressed lenticles (Pl. XI, Fig. A, a).

Agrotis clandestina Harris

Middle coxae touching (Pl. XI, Fig. D). Black subdorsal markings strong on abdominal segment seven but becoming obsolete on segment eight, not including setigerous tubercle I. A linear series of impressed transverse lenticles between and anterior to the prolegs.

Lampra brunneicollis Grote

17. Middle coxae touching (Pl. XI, Fig. D). Hind coxae nearly or quite touching 18

Middle and hind coxae distinctly separated (Pl. XI, Fig. E) 19

18. Process on first ventral rib of mandible a simple triangle (Pl. XI, Fig. H). A minute pale spot on anterior margin of abdominal segments about on a line with setigerous tubercle II (surrounding the minute setigerous tubercle x). Basal width of front normally distinctly greater than its height.

Agrotis c-nigrum Linné

Process on first ventral rib of mandible complex (Pl. XI, Fig. F). A large pale dot on anterior margin of abdominal segments about on a line with setigerous tubercle II, and conspicuous if the surrounding dark pigmentation is developed. Basal width of front normally not greater than its height.

Lampra cupida Grote

19. Third segment of labial palpus minute, no longer than second segment. Black dashes normally present subdorsally anterior to setigerous tubercle II on at least some of the posterior abdominal segments, becoming somewhat triangular on abdominal segment eight 20

Third segment of labial palpus twice as long as second segment (Pl. X, Fig. E). Black dashes anterior to setigerous tubercle II rarely indicated. Four (sometimes but two) subquadrate black spots on dorsum of abdominal segment eight, surrounding setigerous tubercle I and anterior to II.

Agrotis plebeia Smith

20. With a distinct large subdorsal dot on anterior margin of abdominal segments about on a line with setigerous tubercle II and conspicuous if the surrounding dark pigmentation is developed. A subdued band of pale flecks ventrad of the spiracles 21

With a minute subdorsal dot on anterior margin of abdominal segments. A pale line ventrad of the spiracles.

Lampra placida Grote

21. With but one large, diffuse dorsal pale spot on each abdominal segment. Occipital foramen forming an angle of 70 to 75 degrees. Of western distribution.

Lampra barnesi Benjamin

With two smaller diffuse dorsal pale spots on each abdominal segment. Occipital foramen forming an angle of 80 to 85 degrees. Of general distribution.

Lampra alternata Grote

22. Median line of head above apex of front distinctly longer than the height of the front. Spiracles pale with black rims.

Laphygma frugiperda S. & A.

Median line of head above apex of front somewhat shorter than the height of the front. Spiracles deep brown or entirely black 23

23. Cervical shield white with broad black anterior and lateral margins. A pair of large dark chitinous plates between each pair of prolegs except the anal. Setigerous tubercle O^1 on a line which would connect the centers of ocelli IV and VI. Frontal punctures (F^a) well below the line of the frontal setigerous tubercles (F^1).

Eriopyga rufula Grote

Cervical shield dark, nearly unicolorous, with white longitudinal lines. No chitinous plates between the prolegs ...24

24. Head smooth, shining. Skin finely pavement granulose. Setae of body minute, slender. Setigerous tubercles flat.
Polia meditata Grote

Head coarsely granulose. Skin set with coarse, isolated granules. Setae of body stout. Setigerous tubercles conical.
Polia renigera Stephens

25. Adfrontal areas (along lateral margins of front) conspicuous white. Markings of head black 26

Adfrontal areas pale brown, the sutures pale but not white. Head a bright brown which may be somewhat infuscated in an area beside the base of the front.
Prodenia eridania Cramer

26. Head with conspicuous black submedian arcs but remainder of posterior half of head conspicuously reticulate throughout.
Prodenia praefica Grote

Submedian arcs of head indefinite, represented by a broad black area. Posterior half of head mostly black or infuscated, the reticulation obscure and usually visible at lateral margins only.
Prodenia ornithogalli Guénée

27. Hind coxae very widely separated 28

Hind coxae nearly or quite touching 29

28. Spiracles pale yellowish with black rims. Head with strong dark submedian arcs and full dark reticulation. Setigerous tubercles of front (F^1) nearer to the puncture (F^a) than to the lateral margin of front.
Polia detracta Walker

Spiracles entirely black. Anterior three-fourths of head solid black, without reticulation. Frontal setigerous tubercle distinctly nearer to the lateral margin of the front than to the puncture.
Conistra sidus Guénée

29. Spiracles orange with black rims. Length of median line of head above apex of front distinctly greater than the height of the front. Ocellus III more than its width from ocellus IV. Setigerous tubercles A^1–A^2–A^3 forming not more than a right angle at A^2. Setigerous tubercles I and II (dorsal) on the abdomen in distinct round pale spots.
Xylena nupera Lintner

Spiracles pale or pale brown with black rims. Length of median line of head above apex of front less than height of front. Ocellus III about one-half its width from ocellus IV. Setigerous tubercles A^1–A^2–A^3 forming a distinctly obtuse angle at A^2 (Pl. X, Fig. F). Setigerous tubercles I and II not set in pale spots.

Polia purpurissata Grote

The Blueberry Looper

Drasteria graphica Hübner.

Mature larva: Head 2.9 mm. broad. Body about 26 mm. long and 3 mm. broad, first four abdominal segments of about equal width, tapering posteriorly; skin smooth; general color brown. Dorsum to and including setigerous tubercle II infuscated brown, the coloration made up of six narrow pale lines alternating with seven slender fuscous lines. Ventrad of this a broad pale band somewhat flecked with reddish. Including setigerous tubercle III and extending to well below the spiracles, a band of dorsal color bordered ventrally by a pale band flecked with reddish. Venter of dilute dorsal coloration flecked with reddish. Spiracles entirely black. Cervical shield and anal shield infuscated brown, the cervical shield with three pale longitudinal stripes. Head obscurely roughened, the brown adfrontal areas margined by narrow white stripes, a white stripe on median line above the front, remainder of head with three longitudinal white stripes which alternate with prominent reticulate stripes of infuscated brown. Front less than half the height of the head on the median line, white with a dark median stripe.

Distribution: Maine, Manitoba, British Columbia and south along the mountains to Colorado and Nevada.

Food plants: Has caused considerable injury to blueberry in Maine.

The Dingy Cutworm

Feltia ducens Walker.
Feltia subgothica Haworth.

Mature larva: Head 2.5 to 2.7 mm. broad. Body about 22 to 32 mm. long and 3.5 mm. broad, of nearly equal width throughout but tapering slightly posteriorly; skin set with coarse, isolated, shining, roundingly subconical chitinous granules; general color pale grayish brown sometimes tinged with ferruginous. Dorsum paler than the supraspiracular area and sometimes bearing a segmental series of ovoid or rhomboidal infuscated markings. Supraspiracular area fuscous, flecked with white, darker subdorsally and forming definite dark fuscous spots subdorsally on at least the anterior half of each abdominal segment. A band of white flecks below the spiracles. Spiracles entirely black. Head ground color very pale brownish gray or yellowish, with strong fuscous submedian arcs and fuscous or ferruginous reticulation.

Distribution: Occurs in the north throughout the breadth of the United States and Canada but is not usually common south of the latitude of Virginia, Tennessee, Missouri, Kansas, Colorado, and Utah.

Food plants: Buds and newer growth of apple and other trees and also many herbaceous plants.

The Spotted-Legged Cutworm.

Porosagrotis vetusta Walker.

Mature larva: Head 3.2 mm. broad. Body about 40 mm. long and 7 mm. broad, tapering on posterior half; skin very finely pavement-granulose; general color gray. Dorsum light gray without any ferruginous tinge, with traces of a white middorsal line and a pair of more or less fused white supraspiracular lines. Venter, including the line of the spiracles, conspicuously splotched with white to base of prolegs but without any definite subspiracular pale band. Spiracles entirely black. Basal portion of claw of leg broadly rounded, without a trace of angulation. Ground color of head shield pale brownish gray overlaid closely with rather pale fuscous freckles which are darker posteriorly; submedian arcs represented by a fuscous shade.

Distribution: East of the Mississippi River this species occurs along the Atlantic Coast from Nova Scotia to Georgia and is also reported from Michigan. West of the Mississippi River the range includes Arizona, Colorado, California, Washington and British Columbia.

Food plants: Dewberry and peach buds and also many species of herbaceous plants.

The White Cutworm.

Euxoa scandens Riley.

Mature larva: Head 3 to 3.2 mm. broad. Body about 35 mm. long and 6 mm. broad at middle, broadest through first four abdominal segments; skin finely pavement-granulose; general color white. Dorsum tinged with brownish intensified in a line just below setigerous tubercle II, supraspiracular area pale throughout with two pale lines indicated. Spiracles black. A band of white splotches below the spiracles. Venter pale. Setigerous tubercles pale fuscous, II scarcely twice as large as I. Cervical shield infuscated brownish with a symmetrical pattern of dark flecks and the anterior margin infuscated. Each anterior proleg with from eighteen to twenty-five crochets. Head pale brownish, the submedian arcs and reticulation replaced entirely by pale brown freckles which are denser posteriorly.

Distribution: New York, Indiana, Illinois, Missouri, Colorado, and Utah northward into Canada.

Food plants: Apple, bush fruits, pear, grape, peach and various succulent plants.

The Army Cutworm

Chorisagrotis auxiliaris Grote

Mature larva: Head 3.2 mm. broad. Body about 40 mm. long and 5 mm. broad, broadest through abdominal segments one to four; skin finely pavement-granulose; general color pale grayish much flecked with white, the dorsum tinged with brownish and with an indistinct band of white splotches below the spiracles. Cervical shield infuscated brownish, the median third of the anterior margin bearing a distinct dark fuscous area. Setigerous tubercle II usually three times as large as I. Claws of legs with the basal part strongly, acutely angulate. Spiracles entirely black. Head pale brownish gray, the infuscation arranged in pale infuscated brownish flecks somewhat darker posterior.

Distribution: The United States west of the Mississippi River, Canada and Mexico.

Food plants: Buds and newer growth of apple, apricot, blackberry, cherry, currant, goosberry, maple, peach, prune and raspberry and a wide variety of herbaceous plants.

The Dark-sided Cutworm

Euxoa messoria Harris.

Mature larva: Head 3.2 mm. broad. Body about 30 to 37 mm. long and 5 mm. broad, tapering gently posteriorly; skin set with minute, convex, contiguous granules; general color dark grayish. Dorsum brownish or ferruginous and sometimes distinctly reddish, especially posteriorly. Middorsal pale line broad, somewhat broken and broadly margined with fuscous. From subdorsally to the spiracles a fuscous band bearing the usual pair of submedian pale lines. A distinct white band below the spiracles. Venter pale. Spiracles entirely black. Base of claw on leg with an acutely angulate basal tooth. Ground color of head grayish or whitish overlaid with close-set, small, dark fuscous freckles which are usually clearly composite, lines of flecks posterior to the ocelli usually paler and not fused into stripes, but little infuscation dorso-laterally.

Distribution: Canada and the United States as far south as the latitude of Tennessee and California.

Food plants: Buds and newer growth of apple, grape, peach and various shrubs and succulent plants.

The Striped Cutworm

Euxoa tesellata Harris

Mature larva: Head 3.2 mm. broad. Body about 32 mm. long and 5.5 mm. broad, tapering from the metathorax posteriorly; skin finely pavement-granulose; general color gray. Dorsum dull ferruginous. A middorsal and pair of supraspiracular pale lines present. Supraspiracular area darker than the dorsum. A conspicuous white stripe below the spiracles. Venter uniformly pale. Claws of legs with a distinct, acutely angulate basal tooth. Ground color of head shield pale grayish heavily overlaid with infuscation posterolaterally, the reticulation replaced entirely by dark fuscous freckles which are fused to form stripes in the markings centering on the ocelli.

Distribution: The United States north of the latitude of the Ohio River and Virginia, and farther south in the Rocky Mountains. Also occurs in Canada.

Food plants: Buds and newer growth of apple, cherry, pear and plum, and various herbaceous plants.

The White-Spotted Cutworm

Homohadena badistriga Grote

Mature larva: Head 2.5 mm. broad. Body about 35 mm. long and 5 mm. broad, metathorax and abdominal segments one to four of about equal width; skin appearing smooth, under a high power of the microscope it is seen to be set uniformly with extremely minute rounded granules; general color brown both dorsally and ventrally. Dorsum infuscated brown, a geminate middorsal pale line distinct on thorax and abdominal segments seven, eight and nine, less distinct on others upon which it is expanded into a pale spot on the posterior third of the segment from which pale lines diverge through setigerous tubercles I and II of the following segment and converge to the pale spot. A pale spot dorsad of setigerous tubercle I. A strong pale line slightly ventrad of II below which is a fuscous stripe on the abdominal segments. Lower third of supraspiracular area, including the spiracles, infuscated brown; upper two-thirds, from just ventrad of III to the subdorsal fuscous stripe, nearly white, flecked with brown and with a brown line near the dorsal margin. Ventrad of the spiracles a pale stripe flecked with brown. Venter to base of prolegs brown, with a strong white line along the base of prolegs. Spiracles pale yellowish with black rims. Head pale brown. Adfrontal areas black, bordered laterally by a white stripe which is bordered by the black submedian arcs. A white stripe dorsad of the ocelli, through setigerous tubercle L^1. The head is set regularly, medially with very coarse round, polished, convex granules resembling minute ocelli.

Distribution: Maine to Texas, west to Kansas and Colorado.

Food plants: Murtfeldt (2) records that larvae of this species were associated with those of (*Rhynchagrotis*) *Lampra alternata*, (*Peridroma*) *Lycophotia saucia* and *Euxoa scandens* in an outbreak in which oak, elm, apple, pear and cherry trees were damaged. This species normally feeds on honeysuckle and apparently has not been mentioned in economic literature since.

The Black Army Cutworm

Agrotis fennica Tauscher

Mature larva: Head 3 to 3.2 mm. broad. Body about 32 mm. long and 4.5 mm. broad, broadest through abdominal segments two, three and four; skin smooth; general color black or brownish black with pale stripes. Dorsum pale laterally, infuscated or black medially, the infuscation sometimes in the form of a segmental series of ovoid markings. From just ventrad of setigerous tubercle II to and partially including the spiracles, black, with a characteristic pale line near the dorsal margin. Below the spiracles a broad pale band with ferruginous center. Cervical shield black, shining, with only the median pale line present. Spiracles entirely black. Ground color of head yellowish brown, the front, adfrontal areas and a broad margin beside them solid black, reticulation replaced entirely by pale infuscated freckles which are arranged in stripes posterior to the ocelli.

Distribution: In the latitude of New York, Minnesota and British Columbia and northward.

Food plants: Buds and newer growth of apple, blueberry, cherry, poplar, willow, sumach and a great variety of other trees and herbaceous plants.

The Variegated Cutworm

Lycophotia saucia Hübner.

Mature larva: Head 3 to 3.2 mm. broad. Body about 40 mm. long and 6 mm broad, the posterior extremity somewhat enlarged and very blunt; skin smooth; general color varying from very pale gray to the more usual dark fuscous, ground color a dirty yellowish gray. The pale middorsal line is represented on the first four abdominal segments by a distinct yellow or orange dot which may also occur on some of the following segments. A fuscous W-shaped mark, open anteriorly, on the dorsum of abdominal segment eight, followed by a conspicuous yellowish or orange area. Subdorsally a segmental series of linear black spots bordered ventrally by a broken yellowish or orange line which forms an inconspicuous dot about midway of each segment. Supraspiracular area occupied by an inconspicuous, sinuous band of fuscous which is narrowed, or more or less obsolete at the spiracles. Below the spiracles is a border of mingled orange and yellow. Venter pale flecked with white. Spiracles entirely black. Cervical shield with pigment reticulation. Head whitish with broad black submedian arcs and more or less fuscous reticulation.

Distribution: United States and Canada.

Food plants: Apple, apricot, blackberry, box elder, cedar, cherry, currant, gooseberry, grape, honey locust, lemon, maple, mulberry, orange, osage orange, peach, plum, prune, raspberry, sumach, willow and a great variety of herbaceous plants.

The Unmarked Cutworm

Agrotis phyllophora Grote

Mature larva: Head 3 mm. broad. Body about 35 mm. long and 6 mm. broad at middle, abdominal segments of about equal width with seven and eight somewhat broader; skin smooth, with a metallic sheen; general color reddish brown. Coloration made up of fuscous or black flecks on a reddish brown ground. A narrow but strong and continuous middorsal pale stripe strongly outlined in fuscous and extending across the anal shield. Fuscous flecks concentrated dorsally and thinning out toward the spiracles, fused to form definite spots dorsad of setigerous tubercles I and II. No trace of a subdorsal pale line ventrad of setigerous tubercle II or of a segmental series of subdorsal dark markings. Oblique pale triangles indicated posterior to II. Spiracles entirely black. Subspiracular pale stripe not evident in alcoholic specimens. Venter of dilute dorsal coloration. Cervical shield brownish, reticulate with fuscous. Head a decided brown with darker brown submedian arcs and reticulation.

Distribution: Massachusetts, New York and Wisconsin, northward into Canada.

Food plants: Phipps (4) states that wild cherry seems to be the preferred food plant but that the larva accepts alder, birch, blueberry, *Spiraea, Viburnum* and willow.

The W-Marked Cutworm

Agrotis clandestina Harris

Mature larva: Head 2.7 mm. broad. Body about 28 to 35 mm. long and 5 mm. broad, abdominal segments about of equal width throughout; skin smooth; general color varying from pale gray to dark gray.

Dorsum nearly uniformly infuscated, of nearly the same shade as the supraspiracular area or darker, sharply defined even on the thorax. A broken pale middorsal line. A segmental series of black subdorsal markings not wedge-shaped except on abdominal segments seven and eight, with an angular extension which includes setigerous tubercle I and tending to occur on all abdominal segments. The subdorsal black marks bordered ventrally by a distinct white line broadened beside the black marks, reaching setigerous tubercle II, and connected on each abdominal segment with a wedge-shaped pale mark posterior to the black spot extending obliquely upon the following segment. Supraspiracular area nearly uniformly infuscated except that in the line of the spiracles the infuscation is intensified and in an obscure oblique dark stripe originating at the anterior margin of each abdominal segment and extending dorso-posteriorly. Spiracles pale yellowish with black rims. A band of pale flecks ventrad of the spiracles. Venter of dilute dorsal coloration much flecked with white. Cervical shield pale reticulate with black. Head pale brownish with black submedian arcs and reticulation.

Distribution: Kentucky, Missouri, Kansas, Colorado, Utah, Nevada and California northward into Canada.

Food plants: Buds and newer growth of apple, box elder, currant, gooseberry, grape, maple, peach, raspberry and a great variety of herbaceous plants.

The Dash-Marked Cutworm

Lampra brunneicollis Grote

Mature larva: Head 3 mm. broad. Body about 32 mm. long and 6 mm. broad at middle, abdominal segments of about equal width throughout; skin smooth; ground color of body yellowish gray strongly infuscated dorsally and in a stripe occupying somewhat more than the ventral half of the supraspiracular area and including the spiracles. A strong pale middorsal line. A segmental series of subdorsal black dashes on the abdomen anterior to setigerous tubercle II showing no tendency to become wedge-shaped posteriorly and obsolete on abdominal segment eight. A somewhat oblique pale area posterior to each black dash. Bordering the black dashes ventrally is a pale yellowish stripe bordered by fuscous lines. Upper part of supraspiracular area pale yellowish flecked with fuscous. Spiracles pale with black rims. A distinct white subspiracular band flecked with fuscous. Venter of dilute dorsal coloration, the infuscation thinning out midventrally. Cervical shield pale reticulate with brown. Head brown, with dark submedian arcs and reticulation.

Distribution: Virginia, Tennessee, Kansas and Colorado northward into Canada.

Food plants: Phipps (4) lists blueberry (*Vaccinium pennsylvanicum*), dandelion and sweet fern (*Myrica asplenifolia*) and I have collected and reared the larva on a number of low herbs.

The Spotted Cutworm

Agrotis c-nigrum Linnaeus.

Mature larva: Head 3 mm. broad. Body about 35 mm. long and 4.5 to 6.5 mm. broad, abdominal segments of about equal width throughout; skin smooth; general dorsal color varying from brown to a dark uniform drab on a pale yellowish gray ground, and with a metallic sheen. Subdorsally a segmental series of sooty black, wedge-shaped spots obsolete anteriorly. No trace of dark spots above the spiracles. Cervical shield reticulate with infuscated brown, the lateral pale stripes usually not well defined. Spiracles yellowish or whitish with black rims. Head shining, ground color whitish with black submedian arcs and reticulation, the arcs rather angularly diverging at the apex of the front and enclosing a large reticulate area above the front. Each mandible with a large, bluntly triangular tooth basally on the first ventral rib.

Distribution: Virginia, Tennessee, Missouri, Kansas, Arizona, and northward into Canada.

Food plants: Buds and newer growth of apple, cranberry, currant, gooseberry, maple and pear, and a great variety of herbaceous plants.

The Brown Cutworm

Lampra cupida Grote

Mature larva: Head 2.3 to 3.2 mm. broad, unusually variable. Body about 25 mm. long and 4.5 mm. broad, abdominal segments of about equal width throughout; skin smooth; general dorsal color nearly uniform to and including the spiracles except for a broad, broken pale middorsal line which is diffused to form two indefinite pale spots on each abdominal segment, and a segmental series of black subdorsal markings. These markings are more pronounced and wedge-shaped posteriorly. They fade out dorsally, are sharply defined ventrally and are bordered ventrally by a broken pale line. A distinct, round, subdorsal dot of yellowish white on the anterior margin of each abdominal segment about on a line with setigerous tubercle II. Spiracles pale brownish with black rims. A broad pale band below the spiracles, flecked with fuscous and pinkish. Venter pale. Cervical shield reticulate with brown. Under color of head a distinct pale brown with black submedian arcs and reticulation, the arcs tending to fade out anteriorly.

Distribution: Virginia, Ohio, Indiana, Illinois, Kansas and Colorado northward into Canada and also reported from North Carolina, Texas and New Mexico.

Food plants: Buds and newer growth of apple, grape and peach.

The Northwestern Climbing Cutworm

Agrotis plebeia Smith

Mature larva: Head 3 mm. broad. Body about 30 mm. long and 5 mm broad at middle, abdominal segments of about equal width with segment eight somewhat broadened; skin smooth; general dorsal color varying from very pale gray through dark gray and dark brown to blackish. Dorsal coloration nearly uniform, a fuscous reticulation on a pale or pale brownish yellow ground, to and partially including the spiracles except for intensification of the dark coloration at the juncture of the abdominal segments middorsally where the pale line is interrupted and sometimes in the line of the spiracles. Pale middorsal line expanded to form two indefinite, diffuse spots on each abdominal segment. Traces of a segmental series of oblique subdorsal pale triangles which would outline a dorsal series of dark markings but these dark dorsal markings are not distinctly developed. Dark dashes anterior to setigerous tubercle II rarely indicated on some posterior abdominal segments. Four (sometimes but two) subquadrate black spots on the dorsum of abdominal segment eight. A subdorsal pale line. Spiracles white with black rims. A pale or yellowish subspiracular band. Venter of very dilute dorsal coloration much flecked with white. Head pallid with fuscous or black submedian arcs and reticulation.

Distribution: Oregon, Washington and British Columbia.

Food plants: Apple, cherry, hazel, loganberry, raspberry, thimbleberry (*Rubus parviflorus*), rhododendron (*Rhododendron californ*icum) and willow.

The Red Cutworm

Lampra placida Grote

Mature larva: Head 2.2 mm. broad. Body about 20 mm. long and 4 mm. broad, abdominal segments slightly broadened posteriorly; skin smooth; general color faintly brownish gray.

Dorsum to and including the spiracles of uniform coloration except as noted below, and coloration made up of flecks and reticulation of fuscous on a pale ground faintly suffused with pinkish. Middorsal pale line slender, broken. Indistinct pale wedge-shaped marks originating on the subdorsal line ventrad of setigerous tubercle II and extending dorso-posteriorly upon the following segment outlining a segmental series of shield-shaped dorsal markings which are darker at the margins. Subdorsal pale line very slender and much broken. Bordering the subdorsal pale line dorsally on anterior half of abdominal segments (except posteriorly on abdominal segment eight) is a segmental series of linear black marks which are sublinear even on abdominal segments seven and eight, joined on the posterior margin of segment eight. Spiracles yellowish white with black rims. A well-defined white line below the spiracles, no subspiracular pale stripe. Venter pale much flecked with white. Cervical shield white flecked with black. Head very pale brownish, almost whitish, with dilute fuscious submedian arcs and reticulation.

Distribution: From New Mexico, Arizona, and Nevada northward into Canada, and also in New York and Maine.

Food plants: Buds and younger growth of apple, cottonwood, *Crataegus,* grape, greasewood (*Sarcobatus vermiculatus*) and poplar.

Barnes' Climbing Cutworm

Lampra barnesi Benjamin

Mature larva: Head 3 mm. broad. Body about 30 mm. long and 5 mm. broad, of about equal width throughout; skin smooth; general color mottled gray. Ground color light gray, sometimes tinged faintly with brownish, overlaid dorsally, to and including the spiracles, with fuscous or black which does not vary greatly in intensity except in a distinct segmental series of linear to wedge-shaped dark subdorsal markings. These markings are more pronounced posteriorly, fade out dorsally, are sharply defined ventrally and are not margined exteriorly by a pale line. A single, indefinite, diamond-shaped, pale middorsal spot about midway of the length of each of the abdominal segments, more or less outlined with fuscous and including the usual pair of slender, transverse, dark lines. A distinct round, pale subdorsal dot on the anterior margin of each abdominal segment about on a line with setigerous tubercle II. Spiracles pale yellowish or white with black rims. An indefinite, subdued band of pale flecks ventrad of the spiracles. Cervical shield reticulate with fuscous. Head ground color pale gray with the submedian arcs and reticulation fuscous or ferruginous, the arcs tending to be reticulate or dilute anteriorly.

Distribution: Colorado, Arizona, Utah, California and Washington.

Food plants: Considerable damage to peach buds is reported from Colorado, and Washington.

The Mottled-Gray Cutworm

Lampra alternata Grote

Mature larva: Head 2.6 to 3 mm. broad. Body about 30 to 35 mm. long and 5 mm. broad, of practically equal width throughout; skin smooth; general dorsal color pale gray to infuscated brown, the infuscation intensified at juncture of segments middorsally and in the line of the spiracles. Supraspiracular area not differentiated. A segmental series of subdorsal dark markings usually indicated at least posteriorly. A pair of slender transverse dark lines a little anterior to the middle of each abdominal segment middorsally and an obscure, diffuse, pale area both anterior and posterior to these lines forming two indefinite pale spots. A distinct round subdorsal dot on each segment beginning with the metathorax, about on a line with setigerous tubercle II. Spiracles pale brownish with black rims. An indefinite, pale subspiracular stripe. Venter of dilute dorsal coloration. Cervical shield reticulate with fuscous. Head gray with fuscous submedian arcs and reticulation, the submedian arcs tending to fade out anteriorly.

Distribution: Massachusetts, New York, Tennessee, Illinois, Missouri, Colorado and Arizona northward into Canada.

Food plants: Buds of apple, hickory, oak and walnut and probably various other trees and herbaceous plants.

The Fall Armyworm

Laphygma frugiperda S. & A.

Mature larva: Head 2.6 to 2.8 mm. broad. Body about 25 to 36 mm. long and 3 to 5 mm. broad, abdominal segments of practically uniform width throughout; skin set very closely with small, round, convex granules; general color varying from pinkish through yellowish, olivaceous and dull gray to almost black. Dorsal area of general color overlaid with strands and flecks of brownish or fuscous, the middorsal yellowish line subdued in color but broad and sharply defined. A broad yellowish subdorsal line just below setigerous tubercle II. An infuscated band from tubercle II to the spiracle intensified on its dorsal margin to form black dashes on the anterior half of each abdominal segment. Below the spiracles a broad, sharply defined yellow or whitish band more or less mottled with ferruginous. Spiracles pale with black rims and margined with whitish. Setigerous tubercles moderately large, nearly flat, dark dorsally, paler ventrally. Head grayish, pale yellowish or brownish, the adfrontal areas and adjacent margin white, submedian arcs rather slender, reticulation close, ferruginous or brownish more infuscated dorsally and merging into stripes laterally.

Distribution: Massachusetts to Florida and westward to New Mexico, Colorado, Wyoming and Montana. Most common in the southern portion of this range.

Food plants: Prefers cereals and grasses but will attack a wide variety of plants including cranberry, grape, orange, peach and various other trees and shrubs.

The Brassy Cutworm

Eriopyga rufula Grote

Mature larva: Head 2.5 mm. broad. Body about 28 mm. long and 4 mm. broad, of about equal width throughout; skin finely pavement-granulose, the dark areas with obscure, coarse, flattened granules; general color dark, tinged dorsally with pinkish and with a brassy sheen. Dorsal area to slightly ventrad of setigerous tubercle II, pale gray tinged with pinkish and with a segmental series of ovoid infuscated markings. A broken pale middorsal line more distinct toward posterior margin of segments. Traces of a pale line slightly ventrad of setigerous tubercle II; from this to base of prolegs infuscated, darker dorsally and gradually more dilute ventrally, with traces of a pale band below the spiracles. Spiracles dark brown with black rims. Cervical shield white with broad black anterior and lateral margins, the white area occupying more than half of the antero-posterior length of the cervical shield. Head pale with broad black submedian arcs and black reticulation.

Distribution: This species is known from Colorado, Utah, California, Oregon and Washington.

Food plants: Apple, apricot, peach, pear and plum, and various herbaceous plants.

The Pink-Backed Cutworm

Polia meditata Grote

Mature larva: Head 2.3 to 2.5 mm. broad. Body about 25 to 30 mm. long and 5 mm. broad, abdominal segments of about equal width throughout; skin finely pavement-granulose; general color a dark drab specially anteriorly, more or less suffused with pinkish especially posteriorly. Dorsal area pale with an included segmental series of infuscated rhomboidal or ovoid markings at least posteriorly. Supraspiracular area fuscous, intense dorsally on the abdomen except at juncture of the segments and fading out below. Venter sordid, closely flecked with white especially in an area just below the spiracles. Cervical shield deep fuscous with three pale pinkish stripes. Spiracles black. Head smooth, shining, ground color pale yellowish, the submedian arcs and heavy reticulation fuscous.

Distribution: Reported along the Atlantic Coast from New Hampshire to North Carolina and westward to Tennessee, Illinois, South Dakota, Missouri and Kansas. Also found in Canada.

Food plants: Apple and grape and also many species of herbaceous plants.

The Bristly Cutworm

Polia renigera Stephens

Mature larva: Head 2 to 2.1 mm. broad. Body about 20 to 30 mm. long and 4.5 mm. broad, very slightly broadest through the first four abdominal segments; skin set with coarse, isolated, somewhat retrorse, subconical granules; general color pale grayish. Dorsal area pale, including an infuscated band constricted at the juncture of the segments to form a series of rhomboidal or ovoid markings. Subdorsally an inconspicuous pale stripe more or less flecked with ferruginous or brownish. Upper half of supraspiracular area bearing a prominent black stripe. Lower half of supraspiracular area dilute fuscous, much flecked with white. A well defined pale band below the spiracles. Venter sordid, much flecked with white. Cervical shield dark fuscous with pale lines. Spiracles nearly black. Head coarsely granulose, ground color grayish brown, the submedian arcs fuscous and nearly entirely concealing the ground color dorsally.

Distribution: Occurs throughout the United States east of the Mississippi River and is reported in the west from North Dakota, Nebraska, Kansas, Colorado and New Mexico. Also found in Canada.

Food plant: Apple, cottonwood and grape, and many species of herbaceous plants.

The Semitropical Army Worm

(*Prodenia*) *Xylomyges eridania* Cramer

Mature larva: Head 2.6 mm. broad. Body about 38 mm. long and 5 mm. broad, abdominal segments of practically uniform width throughout, segment eight somewhat enlarged; skin smooth; general dorsal color a deep, uniform gray sometimes tinged with olivaceous or pinkish. Middorsal line, subdorsal stripe, and subspiracular stripe unicolorous, whitish tinged with orange or pinkish, the subspiracular stripe much the broadest. Laterally on the dorsum a segmental series of black triangles angulate on their dorsal faces. Ventral half of supraspiracular area dark fuscous, dorsal half paler. Venter pale, suffused with pinkish or orange and much flecked with white. Ground color of head yellow heavily overlaid with bright reddish brown reticulation which is more or less fused forming solid areas of reddish brown; without traces of solid black as found in *ornithogalli* except occasionally in a small area beside the base of the front; adfrontal sutures pale but not white.

Distribution: Georgia, Florida, Texas and California, and occasionally is found as far north as Tennessee.

Food plants: Avocado, castor bean, citrus trees, and willow and also many herbaceous plants.

The Southwestern Army Worm

Prodenia praefica Grote

Mature larva: This larva closely resembles *Prodenia ornithogalli* in coloration but may be readily distinguished by the distinct fuscous reticulation on the posterior half of the head.

Distribution: Reported from California only.

Food plants: Grape, peach and various herbaceous plants.

The Cotton Cutworm or Yellow-Striped Army Worm

Prodenia ornithogalli Guénée

Mature larva: Head 2.8 to 3 mm. broad. Body about 20 to 36 mm. long and 6 mm. broad at middle, enlarged on metathorax, on abdominal segments one and two, and slightly on abdominal segments seven and eight; skin smooth; varying in general color from pale grey to jet black. In well marked individuals the dorsal coloration is made up of intermingled strands of pale and fuscous; the subdorsal triangular dark markings, which are broadest about midway of their length, may be conspicuous on all the abdominal segments or may be obsolete on all but segment eight; there may be a bright yellow band ventrad of the black subdorsal triangles or this may be wholly absent; the upper half of the supraspiracular area is pale with pale and fuscous lines medially; the lower half of the supraspiracular area, including the spiracles, is usually fuscous and there is a subspiracular band of white flecks more or less suffused with orange or pinkish. Spiracles brownish with dark rims. Ground color of head brown overlaid and all but concealed dorsally by deep fuscous, obscurely reticulate laterally, adfrontal areas and adjacent margin of head shield conspicuous white.

Distribution: From Massachusetts and New York to Florida and westward to Minnesota, Nebraska, New Mexico, Arizona and California, but is usually common only in the area south of the latitude of the Ohio River.

Food plants: Cottonwood, peach and raspberry; and a large number of herbaceous plants.

The Silky Climbing Cutworm

Polia detracta Walker

Mature larva: Head 3 mm. broad. Body about 22 mm. long and 4 mm. broad at middle, about of equal width to the sixth abdominal segment, abdominal segments seven and eight rather strongly broadened; skin smooth with a silky sheen; general color dark brown flecked with white.

Dorsal area brown with pale middorsal line obsolete except at the extremities and with triangular pale areas on the posterior half of abdominal segments next to the pale subdorsal line. Supraspiracular area darker dorsally growing gradually more speckled with pale ventrally. Spiracles pale yellowish with black rims. A pale supraspiracular band. Venter dilute brownish flecked with white. Cervical shield polished black with three strong pale lines, the part ventrad of the subdorsal line brown. Anal shield brown with a black median area traversed by the pale middorsal line. Head smooth, brown, the front and laterally to the ocelli uniform dusky gray, strong dark submedian arcs enclosing a large reticulate area above the apex of the front. A dark stripe mediad of the ocelli and similar stripes posterior to them, remainder of the head with close dark reticulation.

Distribution: Maine to Wisconsin and British Columbia and southward to Virginia, Tennessee and New Mexico.

Food plants: Buds of oak. Phipps (4) also lists gray birch (*Betula populifolia*), blueberry (*Vaccinium canadense* and *V. pennsylvanicum*), dandelion, and service berry (*Amelanchier spicata*).

The Black-Faced Climbing Cutworm

Conistra sidus Guénée

Mature larva: Head 3.2 mm. broad. Body about 28 mm. long and 5 mm. broad, broadening gradually posteriorly to abdominal segment eight; skin smooth; general color a deep velvety brown, with obscure pale middorsal and subdorsal lines, the latter usually prominent on the cervical shield. Coloration above the spiracles of one practically uniform shade. Venter paler than the dorsum and strongly suffused with reddish, with a narrow yellowish band below the spiracles. Spiracles entirely black. Cervical shield black, the posterior margin brown. Anterior two-thirds of head heavily overlaid with dark fuscous, posterior third abruptly brownish yellow.

Distribution: Virginia, Tennessee, Missouri, Texas and northward.

Food plants: Azalea, apple, blackberry, hickory, oak, peach and wild cherry, and also tobacco and probably other herbaceous plants.

The False Armyworm

Xylena nupera Lintner

Mature larva: Head 4.8 mm. broad. Body about 40 mm. long and 6.5 mm. broad at middle, abdominal segments of about equal width throughout but tapering slightly posteriorly, skin smooth; occurs in both a green and a brown phase, the dark markings being less intense in the green phase. Dorsum to well below setigerous tubercle II dark with a strong, continuous pale middorsal line and bordered laterally by a yellowish line. Below this and partially including the spiracles a broad band of pinkish brown or green becoming gradually darker ventrally and particularly in the line of the spiracles. Spiracles orange with black rims. A yellow stripe below the spiracles. Venter pinkish or green. Cervical shield and anal shield of one nearly solid color, varying with the phase of the larva, with three pale longitudinal stripes. All setae above the line of the spiracles set in round pale spots. Head greenish yellow, unmarked except for faint pinkish reticulation, pavement granulose throughout and with scattered coarse granules.

Distribution: District of Columbia, Nebraska, Oregon and northward into Canada.

Food plants: Apple, cranberry and various herbaceous plants.

The Blueberry Cutworm

Polia purpurissata Grote

Mature larva: Head 3.5 mm. broad. Body about 34 mm. long and 6 mm. broad at middle, abdominal segments of about equal width throughout; skin smooth; general color grayish brown somewhat suffused with pinkish.

Dorsum to and partially including the spiracles flecked with fuscous which is concentrated somewhat along the broken, indistinct pale middorsal line. Spiracles pale or pale brownish with black rims. A white subspiracular stripe. Venter pale. No other markings. Cervical shield somewhat darker than surrounding areas. Head brown with obscure darker submedian arcs and reticulation.

Distribution: Reported from Quebec, Maine, New York, Colorado, Utah and British Columbia, and said to be most common in Quebec and Maine.

Food plants: Phipps (4) lists blueberry (*Vaccinium canadense* and *V. pennsylvanicum*) and sweet fern (*Myrica asplenifolia*). In addition he names a number of trees and shrubs which the larva accepted readily in confinement.

Literature Cited

1. Franklin, H. J. 1928, Cape Cod Cranberry Insects, Mass. Agr. Expt. Sta., Bull. 239, 67 pp. illus.
2. Murtfeldt, M. E. 1887, Notes from Missouri for the season of 1886, U. S. Dept. Agr. Div. Ent., Bull. 13 p. 60.
3. Phipps, C. R. 1929, Syneda alleni Grt., A Cutworm Destructive to Blueberry in Maine. Jr. Econ. Ent. 22; 137–140.
4. Phipps, C. R. 1930, Blueberry and Huckleberry Insects. Me. Agr. Expt. Sta., Bull. 356. 126 pp. illus.
5. Slingerland, M. V. 1895, Climbing Cutworms in Western New York. Cornell Agr. Expt. Sta., Bull. 104. 48 pp. illus.

Plate X.—Climbing Cutworm Structures.

A. Diagram of first abdominal segment of larva: I, II, III, IV, V, VI, VII^{a}, VII^{b}, VIII setigerous tubercles; *Sp* spiracle; *a* dorsal area; *b* subdorsal area; *c* supraspiracular area; *d* subspiracular stripe; *e* venter.

B. *Euxoa scandens:* End of leg showing shape of claw.

C. *Euxoa messoria:* End of leg showing shape of claw.

D. Front and adjacent areas of larva showing method of measuring basal width and height of front.

E. Anterior end of mentum or "lower lip," ventral view: *S* spinneret; *LP* labial palpus; I, II, III segments of labial palpus.

F. Head of larva, dorsal view: I, II, III, IV ocelli; *Adfa* adfrontal area; *F* front; F^1 frontal setigerous tubercle; F^a frontal puncture; *S* adfrontal suture; A^1, A^2, A^3 anterior setigerous tubercles; L^1 lateral setigerous tubercle; *OF* occipital foramen; *OA* occipital angle; *M* median line of head.

G. *Drasteria graphica:* Diagram of venter of first abdominal segment, *VIII* setigerous tubercle VIII.

H. *Euxoa scandens:* Diagram of venter of first abdominal segment, *VIII* setigerous tubercle VIII.

I. Head of larva, lateral view: I, II, III, IV, V, VI ocelli; A^1, A^2, A^3 anterior setigerous tubercles; O^1 ocellar setigerous tubercle one; L^1 lateral setigerous tubercle.

PLATE XI.—CLIMBING CUTWORM STRUCTURES.

A. *Agrotis clandestina:* Portion of fifth abdominal segment, ventral view; *a* area anterior to prolegs bounded by impressed lenticles.

B. *Euxoa scandens:* Fourth abdominal spiracle.

C. *Porosagrotis vetusta:* Fourth abdominal spiracle.

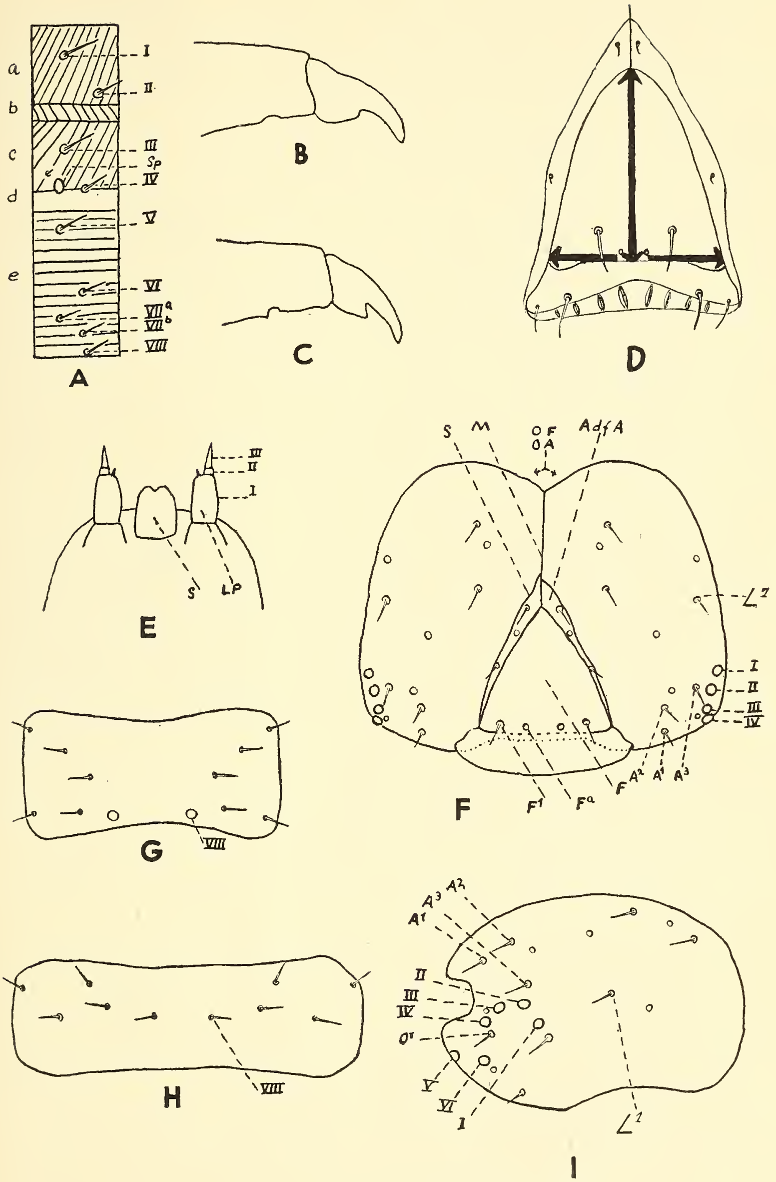
D. *Porosagrotis vetusta:* Middle coxae nearly or quite touching.

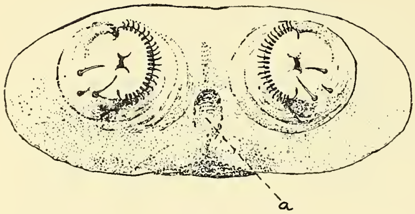
E. *Euxoa scandens:* Middle coxae distinctly separated.

F. *Lampra cupida:* Process on first ventral rib of mandible (shown in black) having a complicated structure.

G. *Polia detracta:* Hind coxae very widely separated.

H. *Lampra barnesi:* Process on first ventral rib of mandible (shown in black) in the form of a simple triangle.

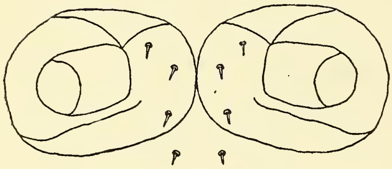

A
B
C
D
E
F
G
H
I
a
b
c
d
e
I
II
III
Sp
IV
V
VI
VII a
VII b
VIII
S
LP
M
OF
OA
AdfA
F
F1
Fa
A1
A2
A3
O1



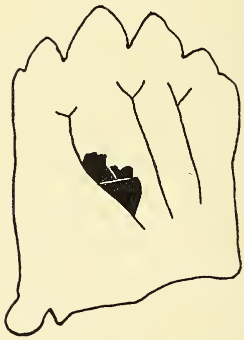
A

B

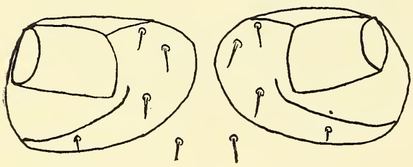
C



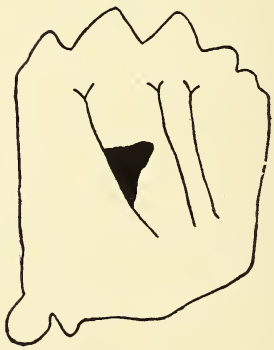
D



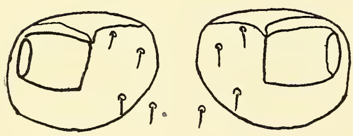
F



E



H



G

A COCCINELLID BEETLE NEW TO THE FAUNA OF NEW YORK STATE.

By Wm. T. Davis, Staten Island, N. Y.

Lately Mr. Roy Latham, of Orient, Long Island, N. Y., sent me a number of insects of several orders for determination, with permission to report upon any interesting specimens. Among the beetles there were five species of Coccinellidae, including specimens of *Hippodamia convergens* with immaculate elytra. Of greater interest, however, were two specimens of a species which usually has eleven spots on the elytra, collected at Orient in August, 1930, and again in August, 1931. They have been identified as *Coccinella undecimpunctata* Linnaeus, and Mr. Charles W. Leng has pointed out that the insect was lately figured by Th. Dobzhansky in *The North American Beetles of the Genus Coccinella,* Proc. U. S. Nat. Museum, Vol. 80, p. 27. 1931.

Dobzhansky records the species from three localities in Massachusetts and also from Alaska. The Massachusetts localities are: Stoneham (F. A. Sherriff), Nahant (F. E. Blaisdell), and Falmouth Heights (T. Dobzhansky). He further states: "This species lives only along the sea coasts of Europe, on saline soils of Middle and Central Asia, and along the coast of the Polar Ocean from Greenland to the mouth of Yenisei. The finding of this species on the Massachusetts coast may be explained by two different hypotheses. First, it may have been introduced there from Europe. Second, it may be native there. In the latter case one may expect that it will be found also along the coasts of Nova Scotia, Newfoundland, and Labrador. The individuals from Massachusetts are quite similar to those from England and the northern coasts of Europe."

In *Psyche,* June, 1912, p. 104, Mr. Charles Schaeffer reported *Coccinella undecimpunctata* from Wollaston, Massachusetts, collected September 5 by Mr. Charles W. Johnson, and Mr. Carl G. Siepmann collected about 25 specimens of the same species, June 22, 1930, at Watertown, Massachusetts, which is just outside of Boston.

As a considerable amount of collecting has been done on Long Island and *Coccinella undecimpunctata* not heretofore reported, it would appear that it may be considered an introduced species.

THE "FIRST SERIES" OF THE BULLETIN OF THE BROOKLYN ENTOMOLOGICAL SOCIETY VOLUMES I–VII: 1878–1885.

By John D. Sherman, Jr., Mount Vernon, N. Y.

Dear Sir.

We herewith take pleasure in sending you the first number of our Bulletin hoping its contents will interest you and induce you to subscribe thereto. Any communication on subjects of interest to Entomology will be welcome.

The very low price of 60 cents for 12 monthly numbers will, we trust, convince you that we work for the love of Entomology and not for the purpose of making money.

Please address

Brooklyn Entomological Society

25 Broadway. Brooklyn E. D. N. Y.

The above notice printed on a slip of paper three inches by five was loosely attached to the front page of the first number of Volume I of the Bulletin, published October 1878, but in all probability very few copies of it have been preserved. The writer has seen only one.

The following collation of the first seven volumes of the Bulletin is the result of a thorough examination of the sixteen sets and large number of odd volumes and numbers now in my possession.

Volume I. 12 numbers: May 1878– April 1879.

Title Page: List of papers (2) pages: 95 pages. (2) plates. And—the above notice.

The following pages of synoptic tables of Carabidae and Lepidoptera Rhopalocera are not numbered:

Pages (5– 6) ; Omophron–Elaphrus.
Pages (21–22) ; Papilio.
Pages (29–30) ; Diachila–Trachypachys.
Pages (37–38) ; Papilio, Parnassius, Pieris.
Pages (45–46) ; Nebria.
Pages (57–58) ; Pieris–Anthocharis.
Pages (63–66) ; Pelophila, Calosoma, Carabus.
Pages (73–74) ; Callidryas–Colias.
Pages (79–82) ; Nomaretus–Sphaeroderus–Cychrus.
Pages (89–90) ; Colias.

There are no pages numbered 13–16 but in their place are pages 5–8 on Amblychila, Omus and Tetracha inserted in Number 2, June 1878, between pages 10 and 11. In the same issue appeared a plate, without number, of these Tiger Beetles and their larvae. This plate is very scarce: in most cases a photostat must be substituted. The other plate of Volume I, also without number, appeared in the issue of March 1879 (No. 11), and represents beetle larvae of the family Tenebrionidae.

Again there are no pages numbered 49–52 in Volume I: the equivalent pages contain a "statement of aims" by the publication committee, followed by three pages of advertisements. These pages constituted an outside cover for pages 41–48 of the October issue (No. 6) for 1878.

The society has in some cases reprinted certain pages of the BULLETIN. Page 75 of Volume I is an example: the advertisements of page (76), however, were not reprinted, but across this otherwise blank page of the reprint is printed the word ADVERTISEMENTS in a vertical position.

Volume II. 12 numbers (in 7): May 1879–April 1880.

Title Page: (2) pages: 100 pages (Index on pages 99–100).

Numbers 5–9, pages 37–(76), in one.

Numbers 10–11, pages 77–92, in one.

In Volume II the following pages of synoptic tables are not numbered:

Pages (15–18); Metrius–Dyschirius.

Pages (25–26); Nathalis–Terias.

Pages (31–34); Bibliography, Ardistomis, Schizogenuis.

Pages (41–42); Heliconius–Colaenis.

Pages (43–44); Platynus: Title Page and Index.

The synoptic tables of Carabidae continue in later pages of Volume II and through Volumes III–VI, but beginning with page 45 of Volume II the regular pagination is used and printed.

Pages (9–12) which are missing in Volume II are accounted for by pages 3–6 of the "Explanation of Terms used in Entomology." No. 1, May 1879, ends with page 8. No. 2, June 1879, begins with page 13. This early Glossary was originally issued a few pages at a time with various numbers of the BULLETIN, and at the foot of page 3 of "Explanation of Terms" is printed the date June 1879, and undoubtedly pages 3–6 were distributed with the June BULLETIN.

The unnumbered pages (75) and (76)—the latter blank, are seldom seen. The first of these contains Schaupp's apology for the delay in publication of Numbers 5–9, September 1879—January 1880, which appeared together: also a letter from H. K. Morrison. Binders have almost unanimously discarded this leaf.

Volume III. 12 numbers: May 1880–April 1881.

Title Page: 100 pages: (2) pages (Index).

Plate of Coleopterous larvae in No. 10 (not No. 8, as printed) opposite page 88.

Volume IV. 12 numbers (in 8): May 1881–April 1882.

Title Page: 62 pages (Index on pages 61–62).. With a plate of Lepidoptera opposite page 7 in Number 1. This plate was published in two states, plain and colored. The figures of this plate are explained at the foot of page 7. These explanations appear also at the foot of the *plain* plate, but *not* on colored examples.

With Numbers 5–10 of Volume IV was distributed the "Check List of North American Macro-Lepidoptera."

Title page: (2) pages: 25 pages: IV pages (Index to genera). 579 species of Rhopalocera and 2,625 species of Heterocera are listed. The preface is dated December 1881, the title page January 1882.

The double-numbers of Volume IV are: 5 and 6, 7 and 8, 9 and 10, 11 and 12.

Volume V. 12 numbers: May 1882–April 1883.

Title page: 90 pages: (2) pages (Index): 3 plates not numbered: one of Coleopterous larvae and pupae opposite page 18: one of Lucanidae opposite page 60: one of Attacus, etc., opposite page 65.

As explained at the end of the Index of Volume V, pages 20–21 are numbered 14–15 by mistake and pages 33–34 are repeated; pages 33–34, 33–34, 35–36 should read 33–34, 35–36, 37–38.

"The Explanation of Terms used in Entomology" began in 1879, was completed, 38 pages (last 12 pages issued with Volume V), and reissued as a separate, no author mentioned (what an oversight!) with a Title Page dated 1883.

Volume VI. 12 numbers: May 1883–April 1884.

Title page: 138 pages (Index pages 137–138): IX pages. 5 plates of Cicindelidae numbered I–V (the first four *colored*), with explanatory sheet. Also a portrait of John L. Leconte.

The entire issue of December, 1883, Number 8, consists of an obituary notice of Dr. Leconte, with his portrait; it is separately paged I–IX.

Numbers 1–7 of Volume VI are paged 1–84.

Numbers 9–12 are paged 85–138.

Volume VII. 12 numbers (in 11): May 1884–April 1885.

Title Page: 159 pages: Index (2) pages. With 3 plates: I of Catocala, II of Cerambycidae, III of Lepidoptera.

The final issue of Volume VII was a double number, 11–12.

The subscribers for the early volumes of the Brooklyn BULLETIN did not have the same penchant for bibliographical niceties which prevailed even at that time among the ornithologists, and copies of any volumes with even a few of their " precious " covers intact at the present time are exceedingly few in number. I do not recall ever having seen a cover for any of the issues of the first two volumes. The various numbers of Volume III appeared in buff covers; the covers in Volumes IV–VII were gray. Besides the regular title-pages, outside colored title-page covers were printed for Volumes II to VII.

One cannot examine the pages of these seven volumes without being impressed and delighted with the merit and charm of their contents. One is almost impelled to think that " what we need in the United States to-day " is a similar magazine for the encouragement and instruction of beginners in entomology. And I know that some of the most advanced students of the order Coleoptera at least, consult constantly with great relief and enlightenment the simple and concise synoptic tables of Carabidae.

It is very fitting that the Brooklyn Society has published the Böving-Craighead " Illustrated Synopsis of the Principal Forms of Coleopterous Larvae," as from the very beginning considerable attention was devoted to the early stages of Coleoptera, in the pages of the BULLETIN.

With the single exception of Williston's paper on the classification of North American Diptera in Number 10 of the final Volume VII of the " First Series," practically the entire contents of the seven volumes concern only the orders Coleoptera and Lepidoptera.

Only two of the contributors to the pages of Volumes I–VII are still living: Dr. W. J. Holland (" Olla Podrida," Volume IV, page 45), now quite grown up, and Charles W. Leng, whose tables of Cerambycidae began in Volume VII—still a mere youngster!

Besides the especially important synoptic tables of Carabidae, Cerambycidae and Butterflies there are Schaupp's work on Cicindeliae (Volume VI, pages 73–124, with 5 plates (4 colored), Fuch's Synopsis of U. S. Lucanidae (Volume V, pages 49–52 and 57–60, with plate), Smith's Synopsis of Noctuidae, Hulst's "Genus Catocala" (Volume VII, pages 14–56), etc., etc.

The society published reprints not only of the "Explanation of Terms" (price 50 cents) and "Check List of Macro-Lepidoptera" (price at first 50 cents, seven copies for three dollars, reduced later to 25 cents each) but also of the "Synopses of North American Species of Coleoptera" (90 Genera of Carabidae), with some changes of arrangement, about 100 pages in all (price one dollar). The table of Platynus was sold separately for 50 cents. Fuch's paper on Lucanidae was also priced 50 cents; so also was Smith's "Genera of Noctuidae." Schaupp's Cicindelidae was surely cheap at one dollar.

The writer has seen a single copy of the reprint of "Bibliotheca Coleopterologica," 14 pages, from Volumes III and IV, published at 25 cents. He selfishly regrets to state that this copy was salvaged by friend Mutchler for the American Museum of Natural History!

The price of the Bulletin was increased from 60 cents to one dollar a year, beginning with Volume III and one dollar was the price for Volumes III to VII, inclusive. For six dollars and twenty cents the subscribers to the "First Series" of The Bulletin of the Brooklyn Entomological Society certainly received full value!

INTERNATIONAL CONGRESS OF ENTOMOLOGY.

"Application blanks for membership and preliminary announcements for the International Congress of Entomology, which is to be held in Paris, July 16–23, 1932, are being mailed to all members of the Society of Economic Entomologists, and the Entomological Society of America. Anyone interested, and who is not a member of either Society, may obtain copies by writing to Prof. R. Jeannel, Museum d'Histoire Naturelle, 45 rue de Buffon, Paris, 5, France, or to O. A. Johannsen, Cornell University, Ithaca, N. Y."

PAEDERUS SIGNATICORNIS SHARP, THE CAUSE OF VESICULAR DERMATITIS IN GUATEMALA (COLEOPTERA: STAPHYLINIDAE).

By J. Bequaert, Harvard Medical School, Boston, Massachusetts.

During the Harvard Medical Expedition's stay on the Pacific slope of Guatemala, for the purpose of investigating Onchocerciasis, I was told of the occurrence at certain seasons of a small insect causing vesicular dermatitis in man. From all accounts the culprit appeared to be a staphylinid, or rove-beetle, of the genus *Paederus,* several species of which are known to cause irritation of the skin. My surmise was confirmed at the Finca Mocá, near Guatalón, where, in April, 1931, I finally secured some of the insects. These were obtained through the efforts of Mr. Emil Hohl, one of the overseers of the plantation. Dr. Edward A. Chapin, to whom some of them were sent, informs me that they are *Paederus signaticornis* Sharp.

In 1921 (Ann. Soc. Belge Méd. Trop., I, No. 2, pp. 227–229), I reviewed the known cases of dermatitis caused by *Paederus.* My summary was recently brought up to date by Dr. E. A. Chapin (1926, Arch. f. Schiffs- u. Tropenhyg., XXX, pp. 369–372). Both Chapin and I, however, overlooked the earliest account of a blistering *Paederus,* published by Vorderman in 1901 (see below, under *P. peregrinus*). A few additional cases have recently come to light, so that vesicular dermatitis in man is known at present to be caused *in nature* by the following ten species of *Paederus.*[1]

1. *P. amazonicus* Sharp causes dermatitis in the region of Manáos, on the Upper Amazon, Brazil, where it is known to the natives by the name of "*poto*" (R. M. Gordon, 1925).

2. *P. columbinus* Laporte de Castelnau is a species widely distributed throughout the Neotropical Region. Pirajá da Silva (1912) incriminated it for numerous cases of dermatitis in the State of Bahia, Brazil, especially in cultivated fields along the rivers São Francisco, Itapicurú and Jacuricy, where it is called, in the vernacular, "*podo*" and "*trepa moleque.*" According to W. P. Chamberlain and D. P. Curry (1928, Rept. Health Dept.

[1] References are given only for the cases not listed by Chapin in 1926, or by myself in 1921.

Panama Canal for 1926, p. 23), this beetle also occurs in the Canal Zone, Panama, although the skin disease it causes has not yet been recognized there.

3. *P. crebrepunctatus* Eppelsheim is an East African species to which P. A. Ross (1916) attributes cases of dermatitis at Nairobi, Kenya Colony.

4. *P. fuscipes* Curtis is found over the entire Palearctic Region, where it is one of the more common species. Some varieties or closely allied species are found also in parts of Africa, southern India, the East Indies, New Guinea and Australia. N. Sacharow (1915) found it causing a severe vesication of the skin in southern Russia, especially in the spring, along the banks of the lower Volga, where it sometimes occurs in thousands. C. Strickland (1924) incriminates the same species for cases of so-called "spiderlick" prevalent in some parts of India, particularly in Assam.[2]

5. *P. goeldii* Wasmann (1905?; not listed by Bernhauer and Schubert and perhaps not described) is credited by E. A. Goeldi (1913) with causing dermatitis on the Rio Purus, Brazil, where it also bears the native name "*poto*."

6. *P. irritans* Chapin (1926) causes a serious skin trouble in the vicinity of Guayaquil, Ecuador. Accounts of these cases have also been published by D. P. Curry [1928, Proc. Med. Assoc. Isthmian Canal Zone, XV (1927), pp. 37–38] and by F. Campos R. (1927, Rev. Col. Rocafuerte, Guayaquil, IX, Nos. 27–28, pp. 227–230).

7. *P. peregrinus* Erichson, often regarded as only a variety of *P. fuscipes,* causes blistering of the skin in Java (at Anjer-Kidoel on the Sunda Straits and at Raoen near Djember), according to A. G. Vorderman (1901, Geneesk. Tijdschr. Nederl. Indië, XLI, pp. 282–284).

8. *P. riparius* (Linnaeus) is the name used by Hiratake Wada (1926, Japanese Jl. Dermat. Urol., XXVI, pp. 1044–1061) for a beetle causing dermatitis in Japan.

9. *P. sabaeus* Erichson is found over most of Africa and Madagascar. According to Mr. Howard Notman's identification, it is the species which J. Rodhain and J. Houssiau (1915) studied as

[2] In a recent letter to Professor W. M. Wheeler, Colonel Wm. Wesley Clemesha calls attention to numerous cases of "spiderlick" caused in Ceylon by a species (as yet unnamed) of *Paederus.*

the cause of an epidemic of vesicular dermatitis at Leopoldville, Belgian Congo (see J. Bequaert, 1921, *loc. cit.*).[3] R. M. Gordon (1925) observed the same species causing vesication of the skin near Freetown, Sierra Leone.

10. *P. signaticornis* Sharp causes dermatitis on the Pacific slope of Guatemala, in the coffee-growing region, at about 3,000 to 4,000 feet altitude, particularly, it is said, toward the end of the rainy season. The adult beetle is about 8 mm. long and 1.5 mm. wide and is mostly black; only the thorax and most of the antennae and femora are of a bright reddish amber color (the tips of the femora black and the antennae darkened about the middle), while the elytra are metallic blue and coarsely punctate. D. Sharp, who described and figured the species (1886, Biol. Centr.-Amer., Coleoptera, I, pt. 2, p. 613, Pl. XVI, fig. 4), records it from Mexico, Guatemala, Honduras and Nicaragua.

In the same general region of Guatemala I found another *Paederus,* which possibly may also sometimes cause dermatitis. It was named for me by the German specialist, Mr. Hans Wendeler, of Berlin-Karow, as *Paederus laetus* Erichson. This species is slightly smaller than *P. signaticornis* (about 7 mm. long) and has only the head black; the elytra are metallic blue and coarsely punctate, the remainder of the insect being reddish amber (darker reddish on the abdomen).

The genus *Paederus* Fabricius is cosmopolitan and contains many species. The latest catalogue of the Staphylinidae, by M. Bernhauer and K. Schubert (1912, in Junk's "Coleopterorum Catalogus") lists some 200 species; but at least 150 more have been described since. The adults usually live on the soil in humid places, in swamps, or along the banks of streams.

E. Jacobson has recently published some interesting observations on the habits of the common East Indian species, *P. fuscipes* Curtis (1930, Tijdschr. v. Entom., LXXIII, p. 333), which may be reproduced in full. "This species is often found in large numbers on the seed-plots, on which the rice is sown before it is transplanted to the inundated sawahs (rice fields). According to

[3] I have recently submitted some of the specimens of *Paederus* studied by Rodhain and Houssiau, to Mr. Hans Wendeler and he also recognizes in them *P. sabaeus* Erichson. Mr. Wendeler furthermore confirmed the identification of *P. signaticornis* Sharp, observed by me in Guatemala.

Dr. K. Dammerman (Landbouwdierkunde van Oost Indië, p. 263) it is very probable that this beetle, as well as its larva, chiefly feeds on the eggs of insects or on the rice cicada. The imagines very often come to light in the evening. A peculiar behavior of these beetles was observed by me in February, 1925, at Fort de Kock (Sumatra's Westcoast). On a warm and sunny day I found numerous imagines swarming along the muddy border of a small waterhole near the rice fields. They were busily running about and every time sallied forth on the water, over the surface of which they moved with considerable speed, all the while propelling themselves by a very quick lateral motion of the abdomen. When they had progressed in this way for about 30 to 40 cm. from the water's edge they generally returned to the land, but sometimes the waterhole was crossed over entirely, a distance of about 2 meters. It was a very lively scene, at every moment here and there a beetle was seen leaving the shore and darting over the surface of the pool. I could not find out the cause of this strange behavior and as far as I was able to ascertain it was not prey they were after."

Little is known as yet of the early stages. C. G. Thomson (1860, Skandinaviens Coleoptera, II, p. 195) described the larva of the European *P. riparius* (Linnaeus), and some excellent drawings of this larva have recently been published by A. G. Böving and F. C. Craighead (1931, Entomologica Americana, N. S., XI, No. 2, Pl. XV, fig. F, and Pl. XVIII, figs. B, C, and F). The larva of the Mexican *P. tempestivus* Erichson was described and figured by E. Candèze (1861, Mém. Soc. Sci. Liège, XVI, p. 329, Pl. I, fig. 2); it was found, together with the adult beetle, on the margin of a pond.

It is probable that many species of *Paederus,* especially those that are able to fly, are at least potential agents of vesicular dermatitis. Some species, however, are either too rare or too far removed from possible contact with people to be of practical importance. The few that are known to be particularly troublesome, only are so when they appear in large numbers in or near habitations or in cultivated fields. Most annoying are those that are attracted by artificial light and thus enter dwellings at night.

F. Netolitzky (1919) has shown experimentally that two common European species, *P. limnophilus* Erichson and *P. ruficollis* Fabricius (=*gemellus* Kraatz), may cause blistering when crushed on the skin. Similar experiments were made by E. N. Pawlowsky and A. K. Stein [1929, Animal Parasites and some Parasitic Diseases of Man in Tadzhikastan (in Russian), pp. 186–189] with *P. albipilis* Solsky, of southern Turkestan. However, these three beetles have not yet been incriminated for cases of dermatitis in nature.

Other experiments were carried out by J. Rodhain and J. Houssiau (1915), with *P. sabaeus*; by R. M. Gordon (1925), with *P. amazonicus* and *P. sabaeus*; by Sophie Gladina (1928, Graefe's Arch. f. Ophthalm., CXX, 1–2, pp. 229–234; 1928, Rev. Microb. Epidém. Saratov, VII, 1, pp. 18–22), with *P. fuscipes*; by Hiratake Wada (1926, *loc. cit.*), with *P. riparius*; and by E. N. Pawlowsky and A. K. Stein (1926, Rev. Russe Ent., XX, pp. 155–160; 1926, Russian Jl. Trop. Med., Nos. 9–10, pp. 13–15; 1927, Trans. R. Soc. Trop. Med. Hyg., XX, 7, pp. 450–451; 1928, Zeitschr. Parasitenk., I, 3, pp. 476–483), with *P. fuscipes.* All these observers agree that no ill effects follow when the beetle is allowed to run undisturbed over the skin. If, however, the insect is irritated and especially if it is rubbed in or crushed, itching pustules or burning rashes appear after an incubation period of eighteen to twenty-four hours. In nature, the dermatitis usually occurs on the neck and arms. The blisters or weals may take one or two weeks to heal and they leave a well-marked scar for several months afterward. The irritation of the skin is caused by some toxic substance which seems to be present especially in the blood of the beetle. This toxin may be extracted with alcohol at 96% or with chloroform. Its exact nature is unknown; but, according to Pawlowsky and Stein, there is every reason to believe that this toxin of *Paederus* is a quite different substance from cantharidin, the active substance secreted by most meloid beetles, such as the Spanish fly, *Lytta vesicatoria.*

A. Castellani and A. J. Chalmers (1919, Manual of Tropical Medicine, 3d. Ed., p. 2204) use the term "seasonal bulbous dermatitis" (a modification of Rodhain and Houssiau's designation "seasonal vesicular dermatitis") for eruptions of the skin caused by the fluids of *Paederus* and other blistering beetles. Their account of blistering due to *Paederus* is not only incomplete, but in some respects misleading. For instance, I am seemingly credited with having seen the disease at Boma, Belgian Congo; but this statement, as originally made, was not based on my own observations and it referred to blistering caused by Meloidae and not by *Paederus.* A. J. Chalmers and H. H. King's paper on "Blister beetles as a public nuisance" (1917, New Orleans Med. Surg. Jl., LXX, pp. 445–455), at Khartoum, Anglo-Egyptian Sudan, likewise deals with meloid beetles and not with *Paederus*.

Accurate accounts of *Paederus* and the dermatitis it sometimes causes are to be found in the recent textbook, "Insects, Ticks, Mites and Venemous Animals of Medical and Veterinary Importance" (1929, vol. I, by W. S. Patton and A. M. Evans, pp. 701–703; 1931, vol. II, by W. S. Patton, pp. 425–428). These authors also figure several of the species, including the African *P. sabaeus*.

Eriopyga contrahens (Wlk.) in Red Pepper.—At Whitefield, N. H., there is a little cabin on Kimball Hill where it has occasionally been my good fortune to be a guest; while there last July a curious lepidopterological find was made in the cabin pantry.

A salt-shaker, with the usual perforated top, used as a container for paprika had been undisturbed since the previous summer. In the small space above the condiment, which nearly filled the shaker, was a dead moth and an empty pupa-skin, and the surface of the paprika was covered with frass and bits of larval skins. Evidently the moth, which proved to be *Eriopyga contrahens* (Wlk.), had accomplished its life story within the narrow confines of the shaker, flourishing upon the pungent contents, and must have come from an egg dropped through one of the holes in the top. I have been unable to find any record of the usual food of *contrahens*, which might throw some light on this odd example of oviposition.—E. T. Learned.

A SURVEY OF THE SPECIES OF TREPOBATES UHLER (HEMIPTERA, GERRIDAE)

By C. J. Drake and H. M. Harris, Ames, Iowa.

The present paper consists of a review of the generic characters of the American water-strider genus *Trepobates* Uhler, the description of a new form, tables for the separation of the species, and discriminative and distributional notes on the eight species now known. In 1894 Uhler proposed the name *Trepobates* to supplant the Hemipterous genus *Stephania* of Buchanan-White, the latter being preoccupied in the Lepidoptera. From *Metrobates* Uhler, *Rheumatobates* Bergroth, *Telmatometra* Bergroth, and other halobatoid genera, *Trepobates* may be separated by the characters of the antennae and legs. Segment I of the antennae is usually slightly shorter, or sometimes a little longer, than II and III taken together. In the males the antennae lack the striking structures peculiar to the members of this sex in *Metrobates* and *Rheumatobates*. The second and third segments, however, are somewhat flattened and thickly pilose beneath (Pl. XII, fig. 11), apparently an adaptation for clasping.

The members of the genus *Trepobates* are rather small and moderately slender, and are not so broad and flattened as those of the genus *Metrobates*. They are very shy, swift, and alert creatures, inhabiting inland bodies of water, and perhaps preferring the quiet coves of the smaller lakes, secluded bays of the larger lakes, and the wider reaches of streams. They are predaceous, feeding largely upon other insects. The coloration is yellow and black, the markings quite variable in a species, yet tending in a long series to follow a general pattern. In some species the dark markings on the dorsal surface are greatly reduced or practically obliterated, whereas in others the color is almost entirely black, the yellow being replaced by black.

Eight species of *Trepobates* are now known. They range throughout the greater portion of the United States and Canada east of the Rocky Mountains, and extend south into the West Indies, Mexico, and Central America. The clothing of the antennae, legs, and genital segments, the male claspers, the proportions of antennal segments, and the connexivum and apex of venter in female are good characters for discriminating the different species.

The genus is monobasic, *pictus* Herrich-Schaeffer being the type. For more than 40 years after the generic name was erected and up to the year 1926 this was the only species recognized in the literature. As a result several species hitherto have been confounded under the name *pictus* and even yet may be found in collections under this specific name. The different species may be separated by the key, figures, and diagnostic notes given in the following pages.

Genus TREPOBATES Uhler

Orthotype, *Trepobates pictus* (H. S.)

Stephania Buchanan-White, Challenger Rept. Zool., VII, 19, 1883, p. 79 (preoccupied).

Trepobates Uhler, Proc. Zool. Soc. Lond., 1894, p. 213; Bianchi, Ann. Mus. Zool. St. Petersburg, I, 1866, p. 70; Kirkaldy, Trans. Amer. Ent. Soc., XXXII, 1906, p. 156; Kirkaldy and Torre-Bueno, Proc. Ent. Soc. Wash., X, 1908, p. 212; Bergroth, Ohio Nat., VIII, 1908, p. 373; Torre-Bueno, Trans. Amer. Ent. Soc., XXXVII, 1911, p. 245; Van Duzee, Cat. Hemip., 1917, p. 430; Hungerford, Sci. Bul., Univ. Kan., XXXI, 1919, pp. 114, 119; Torre-Bueno, Conn. Geol. Nat. Hist. Surv., Bul. 34, 1923, p. 662; Esaki, Ann. Mus. Nat. Hung., XXIII, 1926, p. 139.

Body short, oval, moderately pubescent. Head subtriangular; width of vertex, measured from in front, not greater than length of an eye. Eyes large, placed at back of head, diverging posteriorly and resting partly on pronotum. Antennae reaching beyond middle of body, segment I slightly shorter than II and III conjoined, II usually shortest, IV slightly longer than III. Rostrum reaching to mesonotum. Pronotum in apterous form short, much broader than long, always separate from mesonotum, its front and hind margins nearly straight; in macropterous form longer than broad, the base broadly triangularly produced backwards. Mesonotum in apterous form large, subquadrate, its hind margin truncate except in apterous females of *pictus* (H. S.). Hemelytra reaching beyond apex of abdomen, the coriaceous base with three stout veins, the outer of which is broadest and somewhat strongly setose. Membrane long, truncate and sharply delimited at the base (deälating fracture), with a stout vein paralleling each margin (tending to converge toward apex) and a distinct ridge or fold down the middle.

Front legs stout, the femora more or less bowed; the tibiae simple, flattened within, with an antennal brush before apex; tarsi biarticulate, the first joint scarcely one-fourth as long as the second. Middle legs moderately long, the femora much stouter and shorter than hind femora; only about half as long as the tibiae. Hind legs shorter, the femora slender, nearly twice as long as tibiae. Genital capsule of male cylindrical, symmetrical, the parameres small and more or less hook-like.

Key to Species of Trepobates

A. Males

I. Intermediate legs with femora and basal portion of tibiae clothed within with a fringe of hairs whose lengths are subequally as great as the diameter of the segment at the point where they arise (Pl. XII, fig. 1) II

Intermediate femora and tibiae clothed on their inner margins with much shorter, setose hairs, these never longer than half of diameter of segments where they arise VII

II. Anterior femora with a strong ring-like constriction or impression on upper surface before the apex (Pl. XII, fig. 10) III

Anterior femora not or only very faintly impressed on upper surface before the apex IV

III. Genital segments conspicuously pilose beneath, the first provided along each side beneath with a tuft of long, posteriorly directed, semi-recumbent, brownish black hairs; male claspers as in Pl. XII, fig. 8. *trepidus* D. & H.

Genital segments beneath not noticeably hairy, the first without conspicuous tufts of brownish hairs. *comitialis* D. & H.

IV. Third antennal segment clothed within with a row of long hairs, these often closely appressed to the segment (Pl. XII, fig. 11); first genital rather thickly clothed beneath with moderately long, erect, pale hairs. *knighti* D. & H.

Third antennal segment without long hairs; the first genital not noticeably hairy beneath V

V. Second genital segment thickly pilose beneath; second antennal shorter than third VI

Second genital segment without long hairs beneath; second and third antennals subequal ....*subnitidus* Esaki

VI. Length of first antennal subequally as great as diameter of head; eyes more prominent; clasper shorter and narrower (Pl. XII, fig. 6) .... *inermis* Esaki
Length of first antennal distinctly less than width of head through eyes; eyes less prominent; clasper longer, broader (Pl. XII, fig. 3) .... **becki**, n. sp.

VII. Length of first antennal distinctly greater than width of head through eyes; size larger, predominating color yellow; clasper as in Pl. XII, fig. 4 .... *pictus* (H. S.)
Length of first antennal distinctly less than width of head through eyes; length not more than 2.5 mm.; color in greater part black .... *floridensis* D. & H.

B. Females (*floridensis* is yet unknown)

I. Connexivum produced outward and upward at apex into long curved spines (Pl. XII, fig. 2) .... *knighti* D. & H.
Apices of connexivum not strongly produced II

II. Apical margin of last segment of venter clothed with long hairs (Pl. XII, fig. 7) III
Last segment of venter not ciliate at apex V

III. Posterior femora faintly thickened within before the basal one-third and provided there with a patch of slightly longer hairs (Pl. XII, fig. 9); mesonotum in apterous form truncate behind IV
Posterior femora not clothed with noticeably longer hairs along basal third; mesonotum in apterous form produced backward into a hornlike process (Pl. XII, fig. 5) .... *pictus* (H. S.)

IV. Cilia along apical margin of venter somewhat sparse, becoming shorter toward the median line and distinctly interrupted there (Pl. XII, fig. 7); size larger; diameter of head through eyes distinctly less than width of truncate base of mesonotum in apterous form. . **becki**, n. sp.
Apical venter more thickly clothed with cilia, these longer and not so distinctly interrupted toward the median line; diameter of head through eyes equal to or greater than width of truncate base of mesonotum in apterous form .... *trepidus* D. & H.

V. Segments II and III of antennae subequal. *subnitidus* Esaki
Segment II of antennae distinctly shorter than segment III VI

VI. Form relatively slender .... *inermis* Esaki
Form much broader; subtropical ..... *comitialis* D. & H.

Trepobates trepidus Drake and Harris.

Trepobates trepidus Drake and Harris, Proc. Biol. Soc. Wash., 41, p. 27, 1928.

Slenderer and longer than *inermis* Esaki; the color markings variable as in that species. Apterous and alate forms known. Length, 3.00–4.50 mm.; width, 1.40–1.85 mm. (apterous).

Male: Easily recognized by the long, dark colored hairs arising from the sides of the base of the first genital segment. These hairs usually project obliquely backwards from underneath the margin of the last abdominal segment and lie semi-appressed to the first genital, extending to or beyond its apex. Antennae with first segment subequally as long as diameter of head through eyes; formula, 50 : 25 : 27 : 32. Pronotum in apterous form more than half as long as broad. Fore femora strongly bowed, somewhat more strongly and abruptly than in any other species; the upper surface before apex constricted as in *comitialis.* Intermediate legs fringed within as in *inermis,* the hairs with their tips distinctly recurved and longest toward apex of femora. Venter more strongly pilose than in other species; the last segment three times as long at middle as preceding segment. Genital segments with numerous long, somewhat erect, pale hairs. Clasper curved, much stouter than in *inermis* (Pl. XII, fig. 8).

Female: Very similar to *becki,* n. sp. First segment of antennae (45) shorter than in male. Mesonotum truncate behind, the metanotum with a conspicuous patch of hairs. Connexiva hairy along upper margins, their apices not produced. Last venter strongly ciliate at apex, the hairs being more numerous and longer than in related species. Hind femora with a patch of longer hairs before basal third (Pl. XII, fig. 9).

The types, apterous male and female from Soledad, Mexico, and alate male from Gualán, Guatemala, are in the collection of Iowa State College.

Trepobates comitialis Drake and Harris.

Trepobates comitialis Drake and Harris, Florida Entomologist, XII, p. 7, 1928.

Male: Antennal formula, 45 : 26 : 29 : 30; the length of the first segment slightly less than width of head through eyes. Pronotum of apterous form distinctly more than half as long as broad. Front femora strongly bowed, but not so abruptly or sinuately as in *trepidus,* the upper surface before apex with a distinct annular constriction (Pl. XII, fig. 10). Intermediate femora and tibiae fringed within as in *inermis* (these characteristic hairs are broken off in the type series and the segments were therefore erroneously described as without a fringe). Genital segments not noticeably pilose beneath. Male clasper small, very similar to that of *inermis.*

Female: Very similar to and difficult to separate from *inermis.* First antennal (39) distinctly shorter than that of male. Apex of venter not ciliate. Hind femora without patch of longer hairs along basal third. Connexivum strongly hairy above. Hind tibia longer than one-half of femur.

Length, 3.30–4.00 mm.; width, 1.38–1.80 mm. (apterous).

Originally described from Grenada, West Indies; types in collection of Iowa State College. In addition to the type series there are at hand several examples, including alate individuals, from Weslaco, Texas, collected by M. McPhail. The macropterous individuals have the pronotum formed as in other species.

Trepobates knighti Drake and Harris

Trepobates knighti Drake and Harris, Proc. Biol. Soc. Wash., XLI, 1928, p. 28.

This species is very distinct and easily recognized. The color markings are quite variable. Alate and apterous forms are known.

Length, 3.00–4.30 mm.; width, 1.42–1.60 mm. (apterous).

Male: Antennae somewhat variable, first segment equal to or slightly longer than diameter of head through eyes; third segment provided along lower front margin with a row of very long, fine hairs which generally extend obliquely forward (Pl. XII, fig. 11), these hairs sometimes closely appressed to the segment and therefore easily overlooked. Antennal formula of the apterous holotype 50:25:30:35; winged paratype, 60:30:35:32. Pronotum in apterous form more than half as long as wide. Anterior femora strongly bowed, the upper surface not constricted before apex. Intermediate femora and base of tibiae densely clothed with hairs, the lengths of which are equal to, or even greater than, the diameter of the segment from whence they arise (Pl. XII, fig. 1). First genital segment thickly pilose beneath. Male clasper small, somewhat similar to *inermis* Esaki.

Female: Last segment of venter not ciliate; connexiva always produced outward and upward into long spine-like, hairy processes (Pl. XII, fig. 2). Posterior femora without noticeably longer hairs along basal third. First antennal distinctly shorter than diameter of head through eyes. Apterous form with mesonotum truncate behind, its sides rather conspicuously hairy along the lateral dark stripe.

Holotype (♂) and *allotype* (♀), taken on Turkey Creek, Hollister, Missouri, by Dr. H. H. Knight, in collection of authors. In addition to the types, numerous specimens of this remarkable species have been examined from Missouri, Iowa, and Arkansas. During the past summer, nymphs and adults were taken on a sluggish stream at Ardmore, Oklahoma, by Mr. D. E. Beck.

Trepobates subnitidus Esaki

Trepobates subnitidus Esaki, Ann. Mus. Nat. Hung., XXIII, 1926, p. 141, fig. 6, j–l.

Originally described from two apterous females taken at Clark Junction, Indiana, July 4, 1904, and now deposited in the collection of the Hungarian National Museum. A male taken with the types and a female from the type locality are before the writers. The latter agrees with the original description. The male has the clothing of hairs on intermediate legs similar to *inermis* and other related species. A female from Woodville, Mississippi, August 9, 1921, C. J. Drake, and a male from Summit, Mississippi, September 4, 1926, H. M. Harris, also agree with the description of this species in having the second and third antennal segments subequal. The Mississippi specimens tend to be paler, with a preponderance of yellowish markings, than the examples from the type locality. For a better understanding of the species material is needed for a study of the male genitalia. The Summit specimen, taken in company with numerous specimens of *inermis,* has the clasper very similar to and perhaps identical with that species.

Length, 3.5 mm.; width, 1.8 mm. (apterous).

Trepobates inermis Esaki

Trepobates inermis Esaki, Ann. Mus. Nat. Hung., XXIII, 1926, p. 4, Fig. *f, i*; Drake and Harris, Proc. Biol. Soc. Wash., XLI, 1928, p. 26.

Apterous form with posterior margin of the mesonotum truncate in both sexes. Femora and basal portion of tibiae of the intermediate legs in the male clothed beneath with long hairs, the lengths of which are subequal to the diameter of the segment bearing them. Male claspers (Pl. XII, fig. 6) short, strongly curved, and quite different from those of *pic-*

tus. Antennal formula, 45 : 27 : 29 : 31; the first segment in female tending to be a little shorter than in male. Last genital of male distinctly hairy beneath. Female with margins of connexiva thickly pilose, the base of abdomen above also with a patch of long hairs; venter not ciliate at apex, the hind femora without patches of hairs.

Length, 3.20–4.00 mm.; width, 1.30–1.80 mm. (apterous).

Types, Plummers Island, Maryland; in Hungarian National Museum, Budapest.

This is the most common and widely distributed member of the genus. The antennae, as in *knighti,* vary somewhat in total length and in proportional lengths of the segments. Specimens have been examined from New York, Maryland, District of Columbia, Ohio, Illinois, Iowa, Nebraska, Kansas, Missouri, Tennessee, Mississippi, Louisiana, Texas, and British West Indies.

Trepobates becki, n. sp.

Apterous form: (Male) Somewhat similar to *inermis* Esaki, but slightly more robust. Body above black, marked with an irregular and interrupted broad, testaceous or fulvous stripe on each side. Antennae dark, the basal portion of segment I testaceous; formula, 45 : 27 : 29 : 31. Pronotum silvery pubescent on the sides. Anterior femora strongly curved, yet not so abruptly as in *trepidus,* the upper surface faintly depressed before the apex. Femora and basal portions of tibiae of intermediate legs thickly clothed within with moderately long hairs. Body beneath conspicuously pilose, the second genital segment beneath with long, nearly erect, pale hairs on its disc, its sides without conspicuous tufts of darker hairs. Clasper broad, sharply curved, distinctly longer and stouter than in *inermis* (Pl. XII, fig. 3). Length, 4.00 mm.; width, 1.68 mm.

Macropterous form: Pronotum black, broadly margined behind with fulvous, a broad stripe along each side leading from near anterior margin to base, fulvous. Wings brownish black. Last venter of female (Pl. XII, fig. 7) provided along apical margin, except toward the middle, with long, dark brown hairs. Posterior femora in female faintly enlarged at basal third and clothed there with slightly longer hairs. Length, 5.48 mm.; width, 1.7 mm.

Holotype, apterous male; *allotype,* winged female; and *paratypes,* winged male and female; all taken from a sluggish stream at Colonia Dublán, Juarez, Chihuahua, Mexico, July 23, 1931.

Named in honor of the collecter, Mr. D. Elden Beck. A mutilated apterous male and female, from Tucson, Arizona, undoubtedly belong to this species. The latter are very pale, with the yellow markings predominating, and in this respect remind one of the typical coloration of *pictus.* It is very difficult to distinguish the females of *becki* from those of *trepidus,* the former being a little larger, more strongly widened posteriorly, and having slightly smaller eyes.

Trepobates pictus (Herrich-Schaeffer)

Halobates pictus Herrich-Schaeffer, Wanz. Ins., VIII, 1848, p. 111, figs. 882, 883; Uhler, Proc. Bost. Soc. Nat. Hist., XIX, 1878, p. 437.

Stephania pictus B. White, Challenger Rept. Zool., VII, 1883, 79; Uhler, Stand. Nat. Hist., II, 1883, p. 270.

Trepobates pictus Uhler, Proc. Zool. Soc. Lond., 1894, p. 213; Torre-Bueno, Jour. N. Y. Ent. Soc., XIII, 1905, p. 41; Bergroth, Ohio Naturalist, VIII, 1908, p. 372; Van Duzee, Cat. Hemip., 1917, p. 430; Hungerford, Sci. Bull. Univ. Kan., XXI, 1919, pp. 115, 119; Torre-Bueno, Conn. Geol. Nat. Hist. Surv., Bull. 34, 1923, p. 663; Blatchley, Heterop. E. N. Amer., 1926, p. 985; Esaki, Ann. Mus. Nat. Hung., XXIII, 1926, p. 140, figs. 6, a–e.

Color and pattern extremely variable, but yellow markings usually predominant. Alate and apterous forms known. Length, 3.65–4.00 mm.; width, 1.41–1.72 mm.

Male: Antennal formula, 56 : 30 : 32 : 30; length of segment I always greater than width of head through eyes. Pronotum in apterous form twice as broad as long. Anterior femora bowed, the upper surface without noticeable constriction before apex. Intermediate legs clothed within with very short setose hairs. Last segment of venter at middle only two times as long as preceding. Genital segments without conspicuous clothing. Clasper very long and strongly bowed (Pl. XII, fig. 4).

Female: Antennal formula, 42 : 25 : 31 : 32 (in another individual from same locality, 42 : 27 : 35 : 32). Mesonotum (apterous form) clothed with long hairs along sides where lateral stripe bows; produced backward into a stout, hairy, horn-like process (Pl. XII, fig. 5), this process long, cylindrical, and rather sharp-tipped or broad, flattened, and more or less triangular. Connexivum rather hairy, the apex slightly, triangularly produced. Hind femora without patch of longer hairs before basal third. Last venter ciliate with moderately long hairs, these usually dark but never as long and numerous as in *becki* and *trepidus,* sometimes (specimens from Mississippi) short, pale, and rather inconspicuous.

This is the only species having the mesonotal horn, and as Herrich-Schaeffer specifically mentioned and figured this structure there can be no doubt as to the identity of *pictus.*

Trepobates floridensis Drake and Harris.

Trepobates floridensis Drake and Harris, Ohio Jour. Sci., XXVIII, 1928, p. 273.

Intermediate legs of the male provided with short setose hairs along the inner margins of the femora, the hairs being much shorter and stiffer than in *inermis.* Hind legs with tibia one-half as long as femur. Antennae short and slender, the length of segment I distinctly less than width of head through eyes, II and III about subequal and each half as long as I. Pronotum half as long as broad. Genital segments with clothing hairs not conspicuously longer than those on rest of abdomen. Length, 2.5 mm.; width, 1.00 mm.

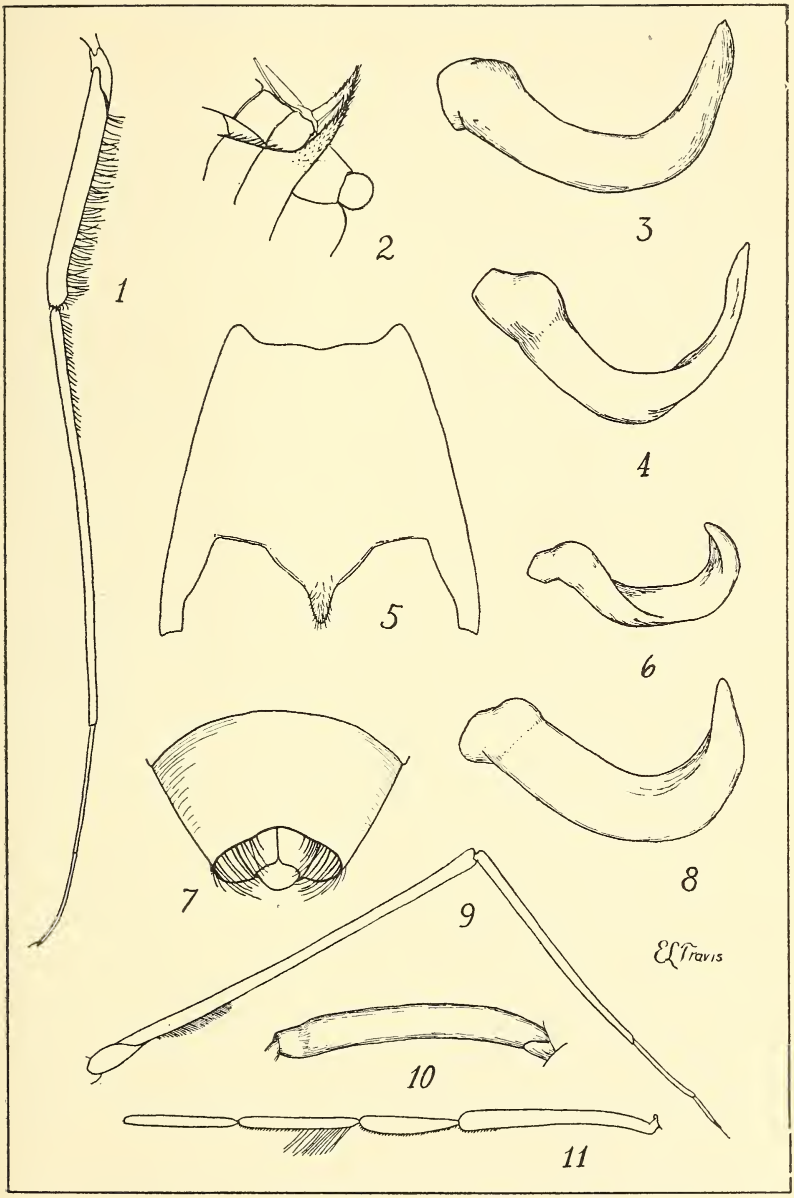
Holotype (♂), Florida, in the collection of the authors.

This species is known only from the apterous male type from the eastern part of Florida. It is of peculiar interest because of its size, being by far the smallest member of the genus. The size alone will suffice to distinguish it from its congeners.

Explanation of Plate XII.

(Drawings by Mrs. E. L. Travis.)

Fig. 1. Intermediate leg of male of *Trepobates knighti* D. & H.
Fig. 2. Abdomen of female of *Trepobates knighti.*
Fig. 3. Clasper of male, *T. becki.*
Fig. 4. Clasper of male, *T. pictus* (H. S.).
Fig. 5. Mesonotum of apterous female, *T. pictus.*
Fig. 6. Male clasper, *T. inermis* Esaki.
Fig. 7. Apex of venter of female, *T. becki* n. sp.
Fig. 8. Male clasper, *T. trepidus* D. & H.
Fig. 9. Posterior leg of female, *T. trepidus.*
Fig. 10. Anterior femur of male, *T. comitialis* D. & H.
Fig. 11. Antennae of male, *T. knighti.*


1
2
3
4
5
6
7
8
9
10
11
E L Travis

A NEW JAPANESE GALL MIDGE.

By E. P. Felt, Bartlett Tree Research Laboratories, Stamford, Connecticut.

Two males of this species were forwarded August 18, 1929, by Tenji Uye, Yasaka, Mura, Hayami-gun, Oita-ken, Japan, accompanied by the statement that the insects were reared from bamboo. The species is tentatively referred to the genus *Trishormomyia.*

Trishormomyia bambusae n. sp.

Male. Length, 2 mm. Antennae about one-half longer than the body, rather sparsely coarse haired, yellowish brown; 14 binodose segments, the fifth with the basal portion of the stem with a length twice its diameter, the distal part with a length one-half greater than its diameter. The basal enlargement globose and with a rather stout circumfilum, the loops extending a little beyond the swelling, the distal enlargement with a length about twice its diameter, slightly constricted at the basal third, with a basal circumfilum and a distal circumfilum, the loops relatively short. There are on the two enlargements three whorls of moderately long, stout setae. Terminal segment with the basal enlargement oblate, the stem with a length three times its diameter, the distal enlargement cylindrical, with a length about three and a half times its diameter and obtusely rounded. Palpi; probably triarticulate. Mesonotum dark brown with the submedian lines and posterior median area fuscous yellowish. Scutellum and postscutellum light yellowish. Abdomen a variable grayish brown. Wings hyaline, the third vein uniting with the margin well beyond the apex, the fifth joining the posterior margin at the distal fourth and apparently simple, the sixth ending at the margin near the basal half. Halteres pale yellowish. Coxae and femora basally mostly pale yellowish, the femora distally, the tibiae and tarsi mostly dark straw. Claws simple, stout, the pulvilli shorter than the claws. Genitalia: basal clasp segment stout, swollen; terminal clasp segment short, stout, nearly straight; dorsal plate broad, triangularly emarginate, the lobes broadly and obtusely rounded. Other characters indistinct in the preparation.

Type deposited in the United States National Museum.

CATALOGUE OF THE PROTURA.[1]

By Harlow B. Mills, Ames, Iowa.

The Order Protura forms one of the most interesting of Arthropod groups. Since its discovery in 1907 by Dr. F. Silvestri in Italy, it has been more or less of a taxonomic football, and has been passed back and forth between the Class Insecta and the Myriopoda.

The Protura are small, blind Arthropods, with piercing-sucking mouthparts, three pairs of legs, and a pair of appendages situated on each of the first three abdominal segments. There are twelve abdominal segments. Antennae are absent. In place of eyes there is a pair of small sense organs known as "pseudocelli" which may be homologous to the postantennal organs found in the Order Collembola. Spiracles and tracheae may be present or absent. In the Eosentomidae two pairs of spiracles are present, one on the meso- and the other on the metathorax, each guarded by an anterior and a posterior seta. The tracheal system is very simple.

The development of the Protura is known as anamorphosis. Young individuals possess nine abdominal segments, obtaining an additional one between the last two at each ecdysis until the total number is attained. Protective glands open posteriorly on the abdomen, which is elevated over the back, staphylinid-like, upon irritation or attack.

Antennal functions are taken over by the fore legs, which possess, besides a well-developed claw on each, numerous sense organs. These legs are held above the head in the position of the antennae.

Invaginated chitinous rods, the apodemes, are often present, attached to the anterior borders of the abdominal segments. These present variation from simple transverse rods to anteriorly curved, widely forked structures, and are often thickened at the middle.

Although the Protura are rather uncommonly met with, they are widely distributed. Since the description of the first species in 1907, some forty-three species and one variety have been recognized, from widely separated parts of the globe. Fourteen of

[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

these species were described from the Nearctic, twenty-seven from the Palaerctic, and two from the Oriental region. A number of these are found in both the eastern and western hemispheres, at least five species being Holarctic in distribution.

There is not entire accord among workers in this group as to the standing of certain genera. The genus *Protapteron* Schepotieff (Zool. Jahrbuch, *28*, pp. 121–138, 1909) was erected for a species *P. indicum* from India, which is figured as possessing antennae and four pairs of abdominal appendages. Since that time Rimski-Korsakov (Zool. Anz., 37, p. 165, 1911) examined a single type of *P. indicum* and pronounced it an *Eosentomon.* Womersley, in his discussion of the situation (Ent. Month. Mag., *64*, p. 232, 1928) seems to have taken the logical view-point. It is very probable that more than one species was included in Schepotieff's material, and one would not presume that the excellent structural figures in his paper were fabrications. In view of the existing data, however, the species is here listed as an *Eosentomon.*

Womersley (*loc. cit.*, *63*, p. 149, 1927) notes the possibility of the genus *Acerentuloides* Ewing being founded on immature examples of some previously described *Acerentulus.* This may be the case, but as the matter is not settled, it is listed herein as it was designated by Ewing.

The change of the generic name *Protentomon* Ewing to *Meroentomon* and the erection of the subfamily Meroentomoninae on the latter by Womersley is not tenable. The term Protentomon was used by Mayer (*vide* Imms' Textbook of Entomology, 2nd edition, p. 3, 1929) as a name for a hypothetical, composite, nonexistent, archetypic insect and not in a generic sense, and thus cannot conflict with the name of Ewing's genus. The name *Protentomon* is restored in the following list and the subfamily name Protentomoninae replaces Meroentomoninae.

Key to the Genera of Protura Silvestri.

1. Spiracles and tracheae present. All three pairs of abdominal appendages two-segmented, with eversible sacs.
   (Eosentomidae).
   Eosentomon.

   Spiracles and tracheae absent. Not more than two pairs of abdominal appendages with two segments and eversible sacs.
   (Acerentomidae) 2
2. First two pairs of abdominal appendages two-segmented.
   (Protentominae) 3

First pair of abdominal appendages alone two-segmented. (Acerentomoninae) 4

3. Dorsal abdominal apodemes absent. A single transverse row of bristles on each abdominal segment ......*Protentomon.*
Dorsal abdominal apodemes present. Abdominal segments 1 to 6 and 8 with two rows of setae dorsally, the anterior ones very fine ....*Paraentomon.*

4. A single row of setae dorsally on each abdominal segment. Tergal plates poorly developed. Dorsal abdominal apodemes present but simple ....*Microentomon.*
Two transverse rows of setae dorsally on each abdominal segment. Dorsal abdominal apodemes (when present) often widely branched laterally, and enlarged in the middle....*5.*

5. Labrum produced in front of the head, spinelike *Acerentomon.*
Labrum reduced to a tubercle, or not apparent ....*6.*

6. Thorax and at least the first abdominal segment devoid of dorsal plates. Dorsal abdominal apodemes absent. *Acerentuloides.*
All thoracic and abdominal segments furnished dorsally with chitinous plates. Dorsal abdominal apodemes present. *Acerentulus.*

Catalogue

Order Protura Silvestri.

Boll. Lab. Zool. gen. agr. Portici, *1,* pp. 296–311, 1907.

Family Acerentomidae Berlese.

Redia, *6,* Fasc. 1, p. 25, 1909.

Subfamily Acerentomoninae Womersley.

Ent. Month. Mag., *63,* p. 145, 1927.

Genus *Microentomon* Ewing.

Proc. Ent. Soc. Washington, *23,* No. 9, p. 199, 1921.

1. *Microentomon minutum* Ewing.
Proc. Ent. Soc. Washington, *23,* No. 9, p. 200, 1921. U. S. A. (Maryland).

2. *Microentomon perpusillum* (Berlese).
Redia, *6,* Fasc. 1, p. 48, 1909. As *Acerentulus.* Italy.

Genus *Acerentuloides* Ewing.

Proc. Ent. Soc. Washington, *23,* No. 9, p. 199, 1921.

3. *Acerentuloides bicolor* Ewing.
Proc. Ent. Soc. Washington, *23,* No. 9, p. 199, 1921. U. S. A. (Maryland).

Genus *Acerentulus* Berlese.

Redia, *5*, p. 122, 1908. Synonymy: *Proturentomon* Silvestri, Atti R. Accad. dei Lincei, Series 5, *18*, 1° Sem., p. 10, 1909.

4. *Acerentulus aureus* Ionescu.
   Bull. Sect. sci. Acad. Roumanie. *13*, p. 20, 1930. Rumania.
5. *Acerentulus californicus* Hilton.
   J. Ent. and Zool., *21*, p. 131, 1929. U. S. A. (California).
6. *Acerentulus cephalotes* (Berlese).
   Redia, *5*, p. 17, 1908. As *Acerentomon*. Italy.
7. *Acerentulus confinis* (Berlese).
   Redia, *5*, p. 16, 1908. As *Acerentomon*. Italy, England, U. S. A. (Iowa).
8. *Acerentulus floridanus* (Ewing).
   Ent. News, *35*, p. 44, 1924. As *Acerentomon*. U. S. A. (Florida).
9. *Acerentulus gracilis* Berlese.
   Redia *5*, p. 122, 1908. Italy, England.
10. *Acerentulus minimus* (Berlese).
   Redia, *5*, p. 17, 1908. As *Acerentomon*. Italy.
11. *Acerentulus muscorum* Ionescu.
   Bull. Sect. sci. Acad. Roumanie, *13*, p. 21, 1930. Rumania.
12. *Acerentulus oculatus* Ewing.
   Proc. Ent. Soc. Washington, *23*, No. 9, p. 198, 1921. U. S. A. (Maryland).
13. *Acerentulus tenuiceps* Ewing.
   Proc. Ent. Soc. Washington, *23*, No. 9, p. 198, 1921. England, U. S. A. (Maryland).
14. *Acerentulus tiarneus* Berlese.
   Redia, *5*, p. 122, 1908. Italy, Germany.

Genus *Acerentomon* Silvestri.

Boll. Lab. Zool. gen. agr. Portici, *1*, pp. 296–311, 1907.

15. *Acerentomon affine* Bagnall.
   Ent. Month. Mag., *49*, p. 173, 1913. England.
16. *Acerentomon agrorum* Womersley.
   Ent. Month. Mag., *64*, p. 114, 1928. England.
17. *Acerentomon americanum* Ewing.
   Proc. Ent. Soc. Washington, *23*, No. 9, p. 197, 1921. U. S. A. (Maryland).
18. *Acerentomon bagnalli* Womersley.
   Ent. Month. Mag., *63*, p. 141, 1927. England.

19. *Acerentomon conurus* Ewing.
Proc. Ent. Soc. Washington, *23,* No. 9, p. 197, 1921. U. S. A. (Maryland).

20. *Acerentomon doderoi* Silvestri.
Boll. Lab. Zool. gen. agr. Portici, *1,* p. 297, 1907. Europe, England, U. S. A. (California).

21. *Acerentomon maius* Berlese.
Redia, *5,* p. 121, 1908. Italy.

22. *Acerentomon mesorhinus* Ionescu.
Bull. Sect. sci. Acad. Roumanie, *13,* p. 20, 1930. Rumania.

23. *Acerentomon metarhinus* Womersley.
Ent. Month. Mag., *64,* p. 113, 1928. England.

24. *Acerentomon microrhinus* Berlese.
Redia, *6,* Fasc. 1, p. 38, 1909. Italy, U. S. A. (California).

25. *Acerentomon nemorale* Womersley.
Ent. Month. Mag., *63,* p. 142, 1927. England.

26. *Acerentomon oblongum* Womersley.
Ent. Month. Mag., *63,* p. 143, 1927. England.

27. *Acerentomon pinus* Womersley.
Ent. Month. Mag., *64,* p. 114, 1928. England.

28. *Acerentomon robustum* Ionescu.
Bull. Sect. sci. Acad. Roumanie, *13,* p. 18, 1930. Rumania.

Subfamily **Protentomoninae** new.

Synonymy: Meroentomoninae Womersley, Ent. Month. Mag., *63,* p. 145, 1927.

Genus *Protentomon* Ewing.

Proc. Ent. Soc. Washington, *23,* No. 9, p. 195, 1921
Synonymy: *Meroentomon* Womersley, Ent. Month. Mag., *63,* p. 145, 1927.

29. *Protentomon transitans* Ewing.
Proc. Ent. Soc. Washington, *23,* No. 9, p. 196, 1921. U. S. A. (Maryland).

Genus *Paraentomon* Womersley.

Ent. Month. Mag., *63,* p. 145, 1927.

30. *Paraentomon carpaticum* Ionescu.
Bull. Sect. sci. Acad. Roumanie, *13,* p. 22, 1930. Rumania.

31. *Paraentomon clevedonense* Womersley.
Ent. Month. Mag., *63,* p. 145, 1927. England.

Family Eosentomidae Berlese.

Redia, *6,* Fasc. 1, p. 48, 1909.

Genus Eosentomon Berlese.

Redia, *5,* Fasc. 1, p. 18, 1908.

32. *Eosentomon armatum* Stach.
Spraw. Kom. Fizjogr. Polskiej Akademji Umiej., *61,* p. 212, 1926. Poland, France, U. S. A. (Iowa).
Synonymy: *E. armatum* var. *semi-armatum* Denis, Bull. Soc. d'Hist. Nat. Toulouse, *56,* 4e Trimestre, p. 583, 1927.

33. *Eosentomon germanicum* Prell.
Zool. Anz., *40,* p. 35, 1912. Germany, England.

34. *?Eosentomon indicum* (Schepotieff).
Zool. Jahrbuch, *28,* p. 121, 1909. As *Protapteron.* India.

35. *Eosentomon javanicum* Berlese.
Redia, *8,* p. 321, 1911, Java. Provisional name for a nymphal form.

36. *Eosentomon minimum* Ewing.
Proc. Ent. Soc. Washington, *23,* No. 9, p. 195, 1921, U. S. A. (Maryland).

37. *Eosentomon pallidum* Ewing.
Proc. Ent. Soc. Washington, *23,* No. 9, p. 194, 1921. U. S. A. (Maryland).

38. *Eosentomon ribagai* Berlese.
Redia, *6,* Fasc. 1, p. 59, 1909. Italy, England, Germany.

39. *Eosentomon silvestrii* Rimski-Korsakov.
Trav. Soc. nat. St. Petersburg, *42,* p. 17, 1911. Russia.

40. *Eosentomon transitorium* Berlese.
Redia, *5,* p. 18, 1908. Italy, England, Germany.

41. *Eosentomon vermiforme* Ewing.
Proc. Ent. Soc. Washington, *23,* No. 9, p. 194, 1921. U. S. A. (Maryland).

42. *Eosentomon wheeleri* Silvestri.
Atti R. Accad. dei Lincei, Series 5, *18,* 1° Sem., p. 8, 1909. U. S. A. (New York).
var. *mexicana* Silvestri, loc. cit., p. 9, 1909. Mexico.

43. *Eosentomon yosemetensis* Ewing.
Proc. Ent. Soc. Washington, *29,* No. 6, p. 146, 1927. U. S. A. (California).

Vol. XXVII JUNE, 1932 No. 3

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
CARL GEO. SIEPMAN GEO. P. ENGELHARDT

Published for the Society by the
Science Press Printing Co.,
Lime and Green Sts., Lancaster, Pa.,

Price, 60 cents Subscription, $2.50 per year

Mailed July 14, 1932

Entered as second-class matter January 21, 1919, at the post office at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

CONTENTS

Bulletin of the Brooklyn Entomological Society

Published in
February, April, June, October and December of each year

Subscription price, domestic, $2.50 per year; foreign, $2.75 in advance; single copies, 60 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXVII | June, 1932 | No. 3

NOTES ON SOME AMERICAN HESPERIIDAE AND DESCRIPTIONS OF NEW SPECIES (LEPIDOPTERA, RHOPALOCERA)

By E. L. Bell, Flushing, N. Y.

Chrysoplectrum justus Plotz.

The insect which Plotz described as *Eudamus justus* from "South America" does not differ in form of the male genitalia from the figure given by Godman and Salvin (Biologia Centr.-Amer., Rhopal., vol. 3, pl. 77, fig. 8) for the genitalia of *Chrysoplectrum perniciosus* Herrich–Schaffer.

There are specimens of *justus* in the collection of the writer which well agree with the description, and the figure given by Draudt (Seitz, Macrolep., vol. 5, pl. 168 e) which presumably is taken from the Plotz drawing. These specimens are from St. Laurent, French Guiana; Obidos, Brazil; Iquitos, Perú; and Santa Cruz, Bolivia. The whitish fringes of the secondaries are distinctly cut by the dark ground color of the wings at the end of the veins, and the two white spots near the anal angle on the underside of these wings, are very prominent.

Chrysoplectrum albovenae n. sp.

Male. Upper side. Of the general appearance of *perniciosus* Herrich–Schaffer, from which it differs in the more violaceous tint of the ground color, against which the veins are faintly contrasted. The fringes of the secondaries are very narrow and entirely pure white. The discal hyaline band of the primaries consists of four spots forming a regular, oblique, transverse band, the spot in interspace 3 nearly filling the angle at the rise of that vein, the inner edge of the band forms an approximately straight line. The secondaries are less produced into a short tail-like lobe at the anal angle than in *perniciosus*.

Beneath. Both wings very dark, violaceous black, the veins white or nearly so. The inner margin of the primaries brown, narrowly along the underside of vein I a little paler. No white spots or lunules near the anal angle and the usual whitish submarginal line of *perniciosus* and *justus* is barely discernible. At the apex of the primaries there is a small white dot in the black fringes.

Expanse: 48 mm.

Holotype male, Massaranduba, Blumenau, Santa Catharina, Brazil, in collection of the author.

The form of the genitalia is the same as that of *perniciosus.*

Paches trifasciatus Lindsey.

This species was described from a single male from Pueblo Pardo, Colony of Perené, Perú. The writer has received a male and a female taken by Mr. Klug, near Iquitos, Perú. The male agrees with the description and the form of the genitalia as figured by Dr. Lindsey.

The female differs from the male in being much paler in color between the dark, velvety bands of both wings and more heavily suffused with yellowish scales toward the outer margin. The primaries have in addition to the single subapical hyaline dot of the male, another smaller dot below it in interspace 6; and two others in a line with it, barely indicated and only seen under a lens, in interspaces 5 and 7; a larger one in interspace 3, well removed from the base of the interspace; two dots in interspace 2, one on the upper side of vein 2, and the other on the lower side of vein 3 and a little further toward the base of the wing than the spot in interspace 3.

Beneath paler and more yellowish than the male, especially the secondaries. Spots of the upper side repeated, the two in interspace 2 much enlarged and triangular, the apex of each nearly touching in the center of the interspace. The black anal spot of the secondaries very prominent against the pale yellow ground color of the wing.

Staphylus tucumanus Plotz (Plate xiii, Fig. I).

Plotz described this species from Cordova, presumably Argentine. In the collection of the writer there are two very similar *Staphylus* species from this and nearby Argentine localities. Plotz, however, states that the palpi of *tucumanus* are white beneath and in one of the species at hand they are of this color, in the other pale yellowish and fuscous. The species having the white palpi are believed to be the insect described by Plotz.

Plotz states that the primaries have a hyaline dot in interspace 8, in the series at hand some have this single dot, others have another one just below it and some have no dots at all. In fresh specimens there is a minute white dot in the fringe at the apex of the primaries, this entirely disappears if the specimen is in the least worn. There are faint traces of narrow, submarginal and discal paler bands on both wings, as usual in many of the *Staphylus* species. The palpi above are brown with a few pale yellow hairs intermixed, beneath white.

These specimens were collected by Mr. Eugenio Giacomelli, of La Rioja, Argentine, and are from Cordova and La Rioja.

Draudt has placed this species (Seitz, Macrolep., vol. 5, p. 906) as "*Staphylus cordovanus* Plotz (*tucumanus ex errore*)" but the reference given for *cordovanus* is the unpublished drawings of Plotz. The writer has been unable to find a published description of *cordovanus*.

The uncus is slender and pointed. The aedeagus very short. The claspers terminate in two parts, the lower rounded at the apex and with a broad, sharp-pointed tooth arising from the dorsal edge; the upper part rounded at the apex below which a broad hook-shaped flange with a rounded apex is directed obliquely inward. The apex of each part carries a brush of stiff bristles.

Staphylus similis n. sp. (Plate XIII, Fig. 5).

Male. Primaries. Upper side. Both wings dark brownish with traces of discal and submarginal paler bands. Primaries with one or two minute subapical, white dots, which may be absent. Secondaries with the outer margin slightly indented between veins 4 and 6. Both wings have scattered yellowish overscaling. Fringes brown indistinctly checkered with darker brown. Male has a costal fold.

Beneath both wings paler brown, with or without traces of the indistinct bands of the upper side and a short, narrow, transverse streak in the cell.

Body above and beneath blackish-brown, a few yellowish scales on the sides of the abdomen. Head and top of the palpi with bright golden-yellow hairs intermixed. Palpi beneath pale yellowish and fuscous, the last joint brownish-black. Pectus yellowish. Legs sprinkled with pale yellow scales.

Female similar to the male.

Expanse: 28–30 mm., male. 28 mm., female.

Type material. Holotype male, Massaranduba, Blumenau, Santa Catharina, Brazil; allotype female, Cordova, Argentine. Paratypes: three males, Cordova; one male, Cosquin; one male without definite locality; one female without definite locality; all Argentine. All in collection of the author.

Although most of the series is from Argentine, the Brazilian male was selected as the type because of its vastly superior condition.

This species resembles *tucumanus* but does not have the white palpi or the white dot in the apical area of the fringe of the primaries. It also resembles *aurocapilla* Staudinger but has much paler palpi beneath. The form of the male genitalia readily distinguishes *similis* from any of the other *Staphylus* species.

The uncus is slender and pointed. The aedeagus longer than in *tucumanus*. The claspers terminate in two parts, the apex of the lower part produced directly upward into a long, sharp pointed tooth; the upper part produced backward onto the disc in an irregular flange. The bristles at the apex of each part are evenly distributed and not in distinct tufts.

Staphylus incanus n. sp. (Plate XIII, Fig. 6).

Male. Upper side. Both wings deep blackish-brown, with an indistinct sub-basal and discal darker band, heavily overscaled with grey, especially between the discal band and the outer margin of the wing. Primaries have no hyaline spots; a costal fold is present. Secondaries with the outer margin rounded. Fringes of both wings blackish.

Beneath paler brown, on the primaries the grey overscaling is principally in the disc and toward the base, on the secondaries very heavy over the entire area below vein 5 and sparsely above that vein.

Body above blackish-brown, a few yellow scales at the base of the abdomen; beneath paler, ventral surface of the abdomen paler brown. Head and palpi above with yellow hairs; palpi beneath blackish with some grey scales at the base and a few yellow scales at the tip. Legs pale brown. Antennae black above, beneath spotted with yellow at each joint.

Expanse: 26 mm.

Holotype male, São Paulo, Brazil, in collection of the author.

This specimen was collected by Mr. Bruno Pohl, of São Paulo, Brazil.

This small species differs from any of the other *Staphylus* species with which the author is familiar, in the very heavy over-scaling of grey scales, giving it a hoary appearance. The accompanying figure of the genitalia will readily serve to identify the species.

The uncus is curved upward and forward, rather slender and pointed. The aedeagus long and comparatively stout for such a small species. The claspers terminate in a serrate, truncate apex, which is dorsally produced into a stout tooth-like flange. The dorsal edge of the disc is produced forward into a short, rounded lobe.

Staphylus inconstans n. sp. (Plate XIII, Fig. 2).

Male. Upper side. Both wings brown with the usual indistinct pale and dark bands. Primaries usually with three minute subapical spots, sometimes so small as to be seen only under a lens, and one specimen seems to be without them. Both wings sparsely overscaled with yellowish or without these scales.

Beneath as above but a little paler, the yellow overscaling sometimes present.

Head, thorax, and top of the palpi blackish with interspersed fulvous scales. Thorax beneath with greyish hairs, abdomen pale brown. Palpi white; pectus greyish-white; Legs greyish or grey-fulvous haired. Antennae black above; beneath spotted with yellow, the club yellow. The primaries of the male have a costal fold. The outer margin of the secondaries rounded.

Female similar to the male, a little paler and the bands of the wings a little more distinct.

Expanse: both sexes 28–30 mm.

Type material. Holotype male and allotype female, Orotina, Costa Rica, September 7, 1931. Paratypes: one male, Guatemala; one male, Progreso, October 2, 1928, and one male, Lancetilla, October 26, 1928, Honduras; one male, Barranquilla, Colombia, July 15; one male, Margarita Island, Venezuela, February 20; two females, Guanta, Venezuela, February 18. The Guatemala specimen was taken by an unknown collector; those from Honduras by Mr. D. M. Bates, and the rest by Mr. O. Fulda. In collection of the author.

The uncus is broad, heavily shagreened, especially along each side and terminates in two short points. The scaphium is well developed, the tips shagreened. The aedeagus is short. The claspers terminate in a broad flange a little rounded at the apex, the dorsal edge produced upward into a triangular flange; the dorsal edge of the disc is produced obliquely downward into a narrow flange extending over the base of the terminal arm, its apex narrowly shagreened; from near the apex of the terminal arm and from the dorsal flange arise a brush of stiff hairs and a like brush arises from near the base of the uncus.

This species resembles *aurocapilla* Staudinger and *aztecus* Scudder, the markings of the wings somewhat more indistinct. It can only be separated from those species, and other similar species, satisfactorily, by the form of the male genitalia.

Augiades pohli n. sp. (Plate XIII, Fig. 4).

Male. Upper side. Primaries. A broad black stigma extending obliquely from the rise of vein 3 to vein 1. From the stigma to the base of the wing, fulvous suffused with black; basal two-thirds of the costal margin fulvous, paler at the extreme costal edge; cell fulvous with a black central bar; an oblique transverse band of fulvous spots, the first below vein 1 toward the base of the wing, the next in interspace 1, triangular, the next and largest in interspace 2, quadrate, the next in interspace 3, triangular, then two further toward the margin in interspaces 4 and 5, oblong, the upper a little the shorter, then two subapical spots, oblong, placed a little inwardly; a black area between the cell end and the spots; the outer margin and apex broadly blackish-brown.

Secondaries. Black, a broad discal, fulvous band, the spot between veins 5 and 6 nearly reaching the margin of the wing; some fulvous hairs in the base of the cell and along the abdominal fold.

Fringe of primaries fulvous at the anal angle, above blackish-brown; of the secondaries fulvous.

Beneath. Primaries. Costal margin to cell end fulvous; apical area and outer margin to vein 2 pale reddish; spots of the upper side repeated, paler; basal area below the cell, inner margin and outside the discal spots below vein 3 black. Secondaries. Ground color pale red-brown, unevenly overscaled with yellow, leaving wavy lines of the ground color; the discal band repeated, but less prominent and paler; a diffuse elongate black spot below vein 1b.

Fringes of primaries fulvous at anal angle, above vein 2 red-brown; of secondaries orange yellow.

Body above brownish-fulvous; beneath yellowish. Shoulder-covers, tegulae, collar and head fulvous. Legs pale red-brown with yellowish hairs. Palpi beneath and pectus yellowish. Antennae black above, fulvous beneath, the apiculus red.

Female. Upper side. Both wings black. Primaries with the costal margin fulvous toward the base, a like spot in the end of the cell; a discal band of like spots placed as in the male but much smaller, that in interspace 1 widely separated from that in interspace 2, the one in interspace 3 a narrow streak, separated from the one in interspace 4.

Secondaries with the extreme costal margin fulvous; a discal band of short, diffuse, fulvous dashes; a few yellowish hairs at the base and toward the inner margin.

Fringes of primaries red-brown with a few black scales intermixed; of secondaries fulvous.

Beneath. Primaries with apical area yellowish followed inwardly by a reddish-brown costal spot; rest of the wing black. Spots of the upper side in the cell and interspaces 1, 2, and 3 are repeated, larger and paler; the spots in interspaces 4 and 5 and the subapical spots are represented by small red-brown dots.

Secondaries. Similar to the male, the wavy lines and spots of the ground color a little more prominent.

Expanse: Male, 38 mm. Female, 36 mm.

Type material. Holotype male, Santa Catharina, Brazil; allotype female, Hansa Humboldt, Santa Catharina, Brazil, in collection of the author.

Named for Mr. Bruno Pohl, of São Paulo, Brazil, who captured the male specimen.

The uncus is long and slender. The aedeagus extremely long, much broader at the apex than at the base. The claspers have the terminal arm curved upward, the apex broad and truncate.

On the upper side this species resembles *Augiades gloriosa* Bell, but these are only two subapical spots on the primaries, in *gloriosa* there are four; the spot above vein 6, of the discal band is placed a little inwardly and the cell spot is a black stripe, in *gloriosa* the spots of the band are in a line and the cell spot is small and near the end of the cell; on the secondaries the second upper spot is not in line with the one above it, in *gloriosa* the discal band is even. The maculation of the secondaries beneath is entirely different in the two species. The female differs from that of *gloriosa* in having the spots of the primaries fulvous, in *gloriosa* they are white hyaline. *Pohli* is much larger and the primaries more pointed than *aligula* Schaus.

Thespius superior Draudt.

This is a synonym of *"Niconiades" tihoneta* Weeks. The species is undoubtedly a *Thespius*. Draudt apparently overlooked volume I of Weeks' "Illustrations of Diurnal Lepidoptera" when he wrote the American *Hesperiidae* section of Seitz Macrolepidoptera of the World as most of the species of *Hesperiidae*, at least, have been omitted from that work.

"Cobalus" gabinus Plotz.

The males of this species have a stigma on the primaries, similar in form to that characterising the genus *Euroto*. *Euroto purgis* Schaus is a synonym.

"Cobalus" subcordata Herrich-Schaffer.

In this species and the form *olympia* Plotz, the males have the characteristic stigma of the genus *Eutychide*.

"Cobalus" physcella Hewitson.

This species also has the stigma of the genus *Eutychide*.

"Cobalus" elegantula Herrich-Schaffer.

The primaries of the males of this species have an indistinct stigma in the angle of vein 2, one part lying along the median vein and the other along the upper side of vein 2. The species is more nearly allied to the genus *Phanes* than to *Cobalus*.

"Cobalus" quadrangular Plotz.

The males of this species have a stigma similar to that of *elegantula*, but the two arms are shorter and more indistinct. It is also more nearly allied to the genus *Phanes*.

Euroto (?) dubia n. sp. (Plate XIII, Fig. 3).

Male. Upper side. Both wings brown. Primaries with a small, diffuse, yellowish spot above the center of vein I, an irregular spot in interspace 2, a slightly smaller one in interspace 3, two small, elongate subapical spots, and two small spots near the end of the cell, the last six spots are yellowish hyaline.

Secondaries with two small yellowish discal dots beyond the end of the cell. Fringes of both wings slightly paler brown.

The stigma of the primaries is an indistinct stripe along the median vein, in interspace 2 and a very small, indistinct spot just below vein 2.

Beneath. Costal margin and apical area of the primaries red-brown, basal area blackish, anal angle paler; spots of the upper side repeated, that in interspace 1 larger and diffuse. Secondaries red-brown, abdominal fold brown, four small, but prominent, semihyaline white spots in a slightly curved discal band. Fringes of both wings brownish with a dark basal line.

Body above brownish, beneath the thorax with greyish and fulvous hairs, abdomen whitish with two brown, longitudinal lines. Head brown with some fulvous hairs. Palpi beneath fulvous and fuscous. Pectus greyish fulvous. Antennae a little more than half as long as the costa, black above, beneath, base of club and apiculus yellowish.

Expanse: 38 mm.

Holotype male, Rio Tapajos, Brazil, in collection of the author. This specimen was also collected by Mr. Bruno Pohl.

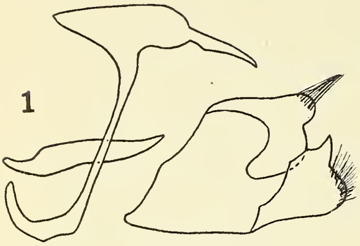
It may be that this species is not strictly congeneric with the type of *Euroto* but it seems to be more easily recognized here than elsewhere. The two cell spots seem to distinguish it from the other members of the genus..

The uncus is rather long, sharply tapering toward the apex which is bifid, the two parts ending in a sharp point. The girdle is short and the saccus long. The aedeagus is very long and gradually widens from the base to the apex. The terminal arm of the claspers is rounded at the apex, with a few short teeth on the dorsal edge.

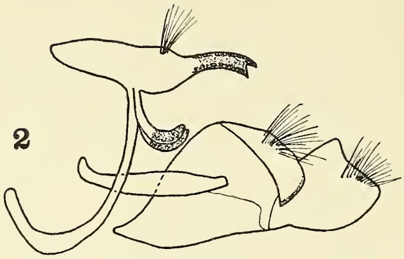
"Padraona" sophistes Dyar.

This is a *Vinius,* the males having the characteristic stigma of the primaries and the hair tuft in the abdominal fold of the secondaries.

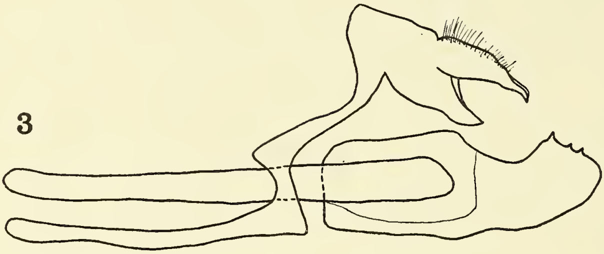
1



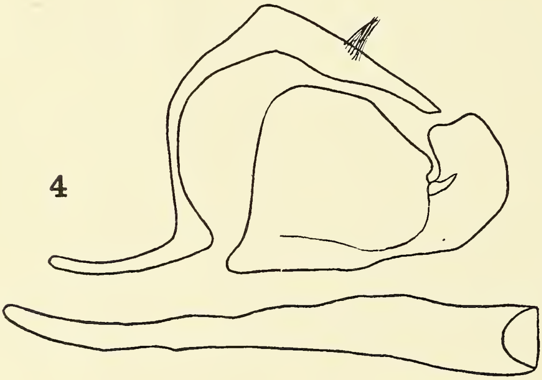
2



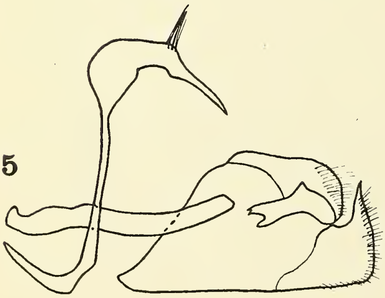
3



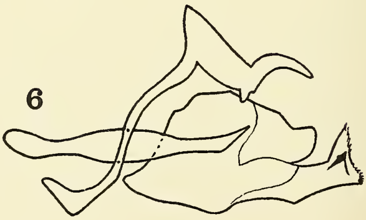
4



5



6



EXPLANATION OF PLATE XIII
MALE GENITALIA

Figure 1. *Staphylus tucumanus* Plotz.
Figure 2. *Staphylus inconstans,* n. sp.
Figure 3. *Euroto (?) dubia* n. sp.
Figure 4. *Augiades pohli,* n. sp.
Figure 5. *Staphylus similis* n. sp.
Figure 6. *Staphylus incanus,* n. sp.

ANOTHER NEW PAMPHANTUS FROM CUBA (HEMIPTERA, LYGAEIDAE)

By S. C. BRUNER, Santiago de las Vegas, Cuba.

In a recent paper by Myers and Salt on "The Phenomenon of Myrmecoidy, with New Examples from Cuba,"[1] H. G. Barber has described a second species of *Pamphantus* from Santa Clara Province, Cuba, Stål having described our very common *P. elegantulus* in 1874, the only other species of the genus known heretofore. This new species of Barber was given the name *mimeticus,* for like *elegantulus,* it is said to exhibit myrmecoidy or ant-resemblance in common with the Attid spider *Synemosyna smithi* Peck. A third and very distinct form of this interesting genus has now been discovered in the western Province of Pinar del Río. This species is of about the same size and form as the other two, and is also characterized by the same peculiar ant-like movements, but no resemblance otherwise to any particular kind of ant or other insect has yet been observed.

Pamphantus vittatus n. sp.

Above dull yellowish white marked with a broad fuscous median vitta extending from head to apex of hemelytra, more strongly marked on membrane. The head, thorax, scutellum, and base of hemelytra are washed with pale stramineous, darker on sides and anterior lobe of pronotum; the humeral angles marked above with deeper yellow. The hemelytra are slightly perlaceous. The fuscous median vitta is indistinct and narrow on vertex, broader and more strongly marked but not sharply defined on pronotum. The scutellum

[1] Trans. Ent. Soc. London, Vol. 74, pp. 427–436, 1 pl. December 21, 1926.

is somewhat infuscate basally from which the vitta is continued over clavus and inner portion of corium to apex of membrane where it is strongly marked and well defined, leaving a pale central area extending from apex of clavus over about basal third of membrane. The narrow commissural margin is pale; the extreme apex of corium is darkened and the arcuated portion of costal margin is very narrowly infuscate. The legs and antennae are stramineous, the latter slightly darker towards apex; eyes black; ocelli margined with red. Below stramineous, the abdomen more or less greenish; rostrum slightly brownish, the apex infuscate.

Head across eyes somewhat broader than posterior lobe of pronotum, vertex flattened, very finely roughened, rather dull; eyes large, strongly projecting as in *P. elegantulus* Stål; ocelli also similar, widely separated from each other and eyes, placed near posterior margin; post ocular distance short but eyes distinctly separated from anterior margin of pronotum; antenniferous tubercles rather prominent. Antennae a little longer than head and pronotum together; segment 1 stout, shortest, segment 2 slightly more than twice as long as 1, subequal to 4 which is narrow spindle-shaped, broader towards apex, very finely pubescent, segment 3 and apex of 2 very finely pilose. Rostrum barely attaining center of mesosternum; basal segment about half as long as head, segment 2 somewhat longer. Pronotum slightly more than one-half longer than wide in front, longer than head, almost perfectly flat above, transverse constriction feeble, placed somewhat behind center; anterior lobe constricted behind head, then gradually broadened with sides sub-parallel, the smooth obtuse lateral carina distinct, nearly percurrent, a smooth area on either side of disc crossed by two oblique rows of coarse punctures, remainder of lobe above and below very coarsely and closely punctate; posterior lobe distinctly shorter than anterior, whole surface very scarcely and rather closely punctate except narrow hind margin. Scutellum nearly as long as broad, coarsely and rather sparsely punctate. Clavus with three rows of coarse puntures; commissure more than one-half longer than scutellum. Corium with costal margin very gently arcuated, subparallel at base; apex extending to about middle line of membrane; two incomplete rows of punctures along claval margin, a regular row along middle vein, gradually curving outward behind almost to apex. Membrane reaching apex of abdomen; veins fairly well elevated, slightly more prominent than in *P. elegantulus*. Mesopleura coarsely punctate; metapleura finely punctate in

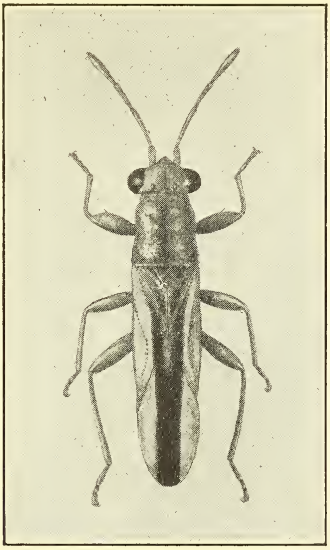


Fig. 1. *Pamphantus vittatus* n. sp.
(Original watercolor by S. C. Bruner.)

large part. Femora incrassate, the anterior pair more so, short, extending to apex of head, armed below before center with short stout spine scarcely as long as diameter of tibia; segment 1 of hind tarsi slightly longer than 2 and 3 together. Venter smooth, impunctate, first 3 segments fused as in other species, lateral margins impressed, about as long as head and thorax. The body is provided above and below with a few long pale scattered hairs. Length 3.31–3.43 mm., width across humeri 0.71 mm.

Type: Male, from Herradura, Pinar del Río Province, Cuba, February 20, 1932, S. C. Bruner and A. R. Otero, coll.; in U. S. National Museum, Cat. No. 44122. Paratypes; Two males taken with type; in collections of H. G. Barber and the Estación Experimental Agronómica, Cuba (N° 9801).

Pamphantus vittatus may be distinguished from *P. elegantulus* by having the pronotum relatively somewhat shorter and broader, the transverse constriction much more feeble, more flattened above and more coarsely and closely punctate, especially the posterior lobe. The surface of the body is also less glossy and the coloration very distinct.

In the illustration of *P. elegantulus* in the paper referred to by Myers and Salt (Plate XCIII, fig. 9), the scutellum is shown as about twice as broad as long; as a matter of fact the scutellum of this species, as well as of *mimeticus* and *vittatus* is almost equiangular.

We have examined specimens of *P. elegantulus* from Santa Clara, Matanzas, Havana and Pinar del Río Provinces, and from the Isle of Pines. There is some variation in coloration, especially as regards the extent and definition of the whitish and fuscous maculae on the hemelytra. In addition to the markings shown on the colored plate by Salt, there is usually a more or less distinct longitudinal fuscous vitta between the calli on the anterior lobe of pronotum. Uhler lists *elegantulus* from the "Southern States" and although there appears to be no more recent record, it should certainly be expected in extreme southern Florida at least.

From *Pamphantus mimeticus* Barber *vittatus* may be readily distinguished by the entirely different coloration and by having the transverse constriction of the pronotum less distinct and located nearer the center.

Correction to Climbing Cutworms.—The figure 10 at the lower right of page 74 of the Bulletin for April should be an 8; and the figure 8 at the lower right of page 75 should be a 10. All users of the key to the cutworms beginning on page 74 should make this correction in their copies of the Bulletin.—S. E. Crump, Puyallup, Wash.

RANDOM NOTES AND DESCRIPTIONS (COLEOPTERA).

By H. C. Fall, Tyngsboro, Mass.

Hydroporus.

In my Revision of the North American Species of Hydroporus (1923), two errors of identification have since been detected. I refer to *H. persimilis* Cr. and *H. addendus* Cr. Crotch's descriptions of about three lines each appeared in his Dytiscidae paper of 1873 and are in themselves wholly inadequate as a means of identification. However in my preliminary survey of the Le Conte material at Cambridge I found examples purporting to be these species, the name label of *persimilis* being in Horn's hand and that of *addendus* in the writing of Le Conte. There seemed to be no reason for doubting the correctness of the labels and they were accepted as true representatives of the species. Crotch's descriptions were based on examples in the Horn cabinet, and later investigation with Mr. Liebeck's assistance shows definitely that both species in the Le Conte collection were wrongly named.

The true *H. persimilis,* it now appears, is that species which I described as new under the name *aequus.* The *persimilis* of the Le Conte collection as stated in my paper does not appear to differ specifically from *stagnalis.*

The true *H. addendus* is the species which I described as new under the name *pinguis.* This leaves the *addendus* of my revision without a name and I propose to call it **H. deceptus** n. n., which name may be substituted for *addendus* in my paper. I have attached the type label to the Ojai, Cal., specimen mentioned in the Revision. I have since received another example taken by Mr. A. C. Davis at Pasadena, Cal. IX–15–19.

Hydroporus brodei Gellerman, Pan Pacific Ent., V, p. 63 (Oct., 1928).

This agrees so completely with *H. quadrimaculatus* Horn in all essential features that it is impossible to consider it anything more than a smoother more northern variety of that species. It differs from the typical Nevada and California form of *quadrimaculatus* only in being more finely punctate, and in its generally better defined discal series of eltyral punctures. In my two examples of the typical form the elytral series are detectable only with difficulty; in *brodei* they are fairly distinct as a rule, but in some examples are much less so. The character is evidently a variable one.

In his description of *quadrimaculatus* Horn calls attention to the acuminately produced ventral apex in the female. A precisely similar process of the last central exists in the female of *brodei* though not mentioned by its author. The structure is a very unusual one but occurs also in one or two other species of the subgenus Oreodytes. *Brodei* was described from Walla Walla, Washington; my examples are from North Bend, Wash. (Darlington), and Beaver Creek, Alberta (Carr).

Hydroporus barbarae n. sp.

Narrowly oval, subdepressed, slightly attenuate behind, fuscous brown above, black beneath, legs and antennae reddish brown, the latter infuscate toward the apex. Punctuation throughout almost precisely as in *terminalis,* to which it is most closely related and with which it nearly agrees in the comparatively wide (for the group) side margins of the prothorax. It differs from *terminalis* in its slightly larger size and less evenly oval outline and in the conspicuously more strongly developed protarsal claws of the male. In *terminalis* as in all previously known species of the group there is scarcely any detectable sexual difference in the claws, these being small and simple and sensibly equal on the front and middle feet. In the present species the claws of the protarsus are nearly twice as large as those of the mesotarsus, a little thickened and more abruptly curved at base.

Length 3 mm.; width 1.4 mm.

The unique male type bears label " S. Barbara sea sh. Cal., F. E. Winters." It was sent me by Mr. J. B. Wallis, who kindly allows me to retain the specimen.

DEROVATELLUS Sharp.

D. floridanus n. sp.

Elongate oval, widest at middle of length; head, thorax, antennae and legs yellow, the hind margin of the pronotum very narrowly edged with blackish in about its middle third; elytra fuscous brown, a small irregular obscure yellowish spot near the lateral margin just before the apical third; surface feebly shining and with rather sparse recumbent fulvous pubescence.

Head about three-fifths as wide as the thorax; eyes large, their width as viewed from the front a little more than half the interocular distance; surface finely sparsely punctate, clypeal margin not thickened.

Prothorax not quite two-fifths as long as wide, widest at base, sides broadly arcuate becoming straighter posteriorly, lateral margin very narrow; surface punctures nearly evenly distributed, a little coarser and closer than on the head.

Elytra twice as long as wide, as wide at base as the base of the thorax, pointed behind, sides arcuate throughout and making with sides of thorax a very flat angle; surface moderately closely not coarsely punctate, without trace of striae or rows of coarser punctures.

Metasternum and abdomen rufopiceous, the latter paler at apex; sides of body with numerous coarse punctures; anterior coxae rather narrowly separated, the prosternal process short, roof shaped, margined at sides and abutting against the contiguous middle coxae; posterior coxal lines subparallel, but slightly more distant anteriorly; apex of coxal processes conjointly broadly angularly emarginate. Basal two joints of pro- and mesotarsi in the male moderately dilated, slightly longer than wide, their apices a little oblique; third joint almost linear, about four times as long as wide; tarsal claws all very small and slender.

Length (type) 3.9 mm.; width 1.7 mm.

Described from three examples, all males and of uniform size, sent me by Mr. W. S. Blatchley, who writes that they with one other were taken at light by Mr. M. F. Jones at Royal Palm Park, Florida, during January and February, 1930. The type, bearing date Jan. 7, remains in my collection; two paratypes dated Feb. 3 are returned to Mr. Blatchley.

The appearance of this species in Southern Florida is noteworthy as being the first known instance of the occurrence of the genus *Derovatellus* within our faunal limits. Only three species of the genus have been previously described, viz., *D. lentus* Wehncke (Stett. Ent. Zeit., 1876, p. 357) from "South America and the Antilles" (Sharp); *D. bruchi* Zimm. (Archiv. fur Naturgeschichte, 1919, p. 125) from Argentina, and *D. orientalis* Wehn. (Deuts. Ent. Zeits., 1883, p. 149) from Borneo. If the last named species is strictly congeneric with the others it indicates a quite remarkable distribution.

The present species must be rather nearly allied to *lentus,* but according to description this latter has the elytra without maculation, the sides of the prothorax subsinuate, and the form much stouter, since by Sharp's measurements, with a shorter length the width is actually greater than in *floridanus.* In general aspect *D. floridanus* rather strikingly resembles an enlarged *Bidessus* of the subgenus *Bidessonotus* (*B. pulicarius,* etc.) except that it lacks the striae at base of prothorax and elytra; it is however at once separable from *Bidessus* and from every other *Dytiscide* of our fauna with the single exception of the rare *Macrovatellus mexicanus* of Lower California by the prominent contiguous middle coxae, which prevent the prosternal process from attaining the metasternum.

Talanus

In the Canadian Entomologist, 1895, p. 321, Dr. John Hamilton —apparently quoting Dr. Horn—states that the *Talanus* (*Dignamptus*) *langurinus* and *T. stenochinus* of Le Conte are two names representing the extremes of one species, and that Horn calls the species as a whole *langurinus.* This dictum is followed in the Leng Catalog although according to nomenclatorial rules the name should be *stenochinus* rather than *langurinus* because of page precedence. This however need not concern us for it is quite certain that Horn and Hamilton were in error in this matter, the two species in question really being quite distinct from each other.

In describing his *T. okechobensis* (Can. Ent., 1914, p. 143) Blatchley realized that there were two species of *Talanus* in Florida, but he was at fault in that he failed to recognize that his species was precisely the same as Le Conte's *stenochinus.*

Our two species may be separated by the following characters:

Talanus stenochinus Lec. (= *okechobensis* Blatch.).

Size larger (6–7 mm.), castaneous brown without aeneous lustre; elytral punctures occupying distinct grooves; front and middle tibiae toothed at about apical third or fourth in both sexes, hind tibiae simple.

T. langurinus Lec.

Smaller and a little more slender, length 3½–5 mm.; color castaneous, the elytra with faint aeneous lustre; elytral series except the sutural scarcely impressed; all the tibiae in the male with a small acute tooth slightly nearer the apex than in *stenochinus,* all the tibiae in the female simple.

Blatchley's statement that the front tibiae are not toothed in *langurinus* is probably due to his having examined only females.

It is difficult to explain just why Le Conte described both of these species as "black," for not only are all his specimens of the usual chestnut brown color but it is highly improbable that he or any one else ever saw a black individual of either species.

ADDITIONAL NOTES ON NEARCTIC MECOPTERA.

By F. M. Carpenter, Museum of Comparative Zoology.

During the summer and fall of 1931, after my revision[1] of the Nearctic Mecoptera had been sent to the press, several additional and interesting collections of these insects were forwarded to me for identification. Among them was the collection of the late James S. Hine, who wrote two synoptic papers on the North American scorpion-flies over thirty years ago. He himself had selected and packed the material for me, but succumbed to his illness before he was able to send it. Mr. C. H. Walker, of the Ohio State Museum, noting the package on Mr. Hine's desk, kindly shipped it to me. For the other specimens, received too late for inclusion in my paper, I am indebted to Professor James G. Needham, Cornell University; Dr. F. M. Gaige, University of Michigan, and Mr. Robert Browne, Pittsfield, Mass. Although there are no new species in any of these collections, several specimens are of unusual interest because of the localities at which they were secured. In the following list I have included the noteworthy records:

Merope tuber Newman.

Professor Needham secured over a hundred specimens of this rare and remarkable insect at Davenport, West Virginia, during the latter part of June, 1930. This discovery of a locality where *Merope* is relatively abundant may lead to the knowledge of its life-history.

Panorpa mirabilis Carp.

One male from Oakmont, New Jersey (June 14), in the Michigan collection; this is the only record in that state aside from the holotype (Andover).

Panorpa claripennis Hine.

In Hine's collection there are several specimens of both sexes from Sandusky and Georgesville, Ohio (July); this is the first record of the species in that state. From Mr. Browne I also received the first specimen (♂) of *claripennis* recorded from Massachusetts; it was collected by him at Pittsfield, June 9, 1931.

[1] Bull. Mus. Comp. Zool., *72* (6): 205–277; pls. 1–8. 1931.

Panorpa nebulosa Westwood.

In Hine's collection there are several specimens from Akron (July 24) and Coshocton (June 11), Ohio; the only previous record for that state is Columbus.

Panorpa sigmoides Carp.

Several specimens of this species are included in Hine's collection, all from Sandusky, Ohio (July 12), comprising the first record from the state. *Sigmoides* has been taken commonly in the northeastern section of Illinois and adjoining parts of Indiana. Its presence in northern Ohio extends the range considerably, and suggests that it occurs in other neighboring states.

Panorpa acuta Carp.

Numerous males from Elkmont, Servier Co., Tennessee (August 14, 1931), are in the Michigan collection. This is the first record in the state.

Panorpa maculosa Hagen.

In the University of Michigan collection there is a male from Elkmont, Servier Co., Tennessee (August 11, 1930). This is only the second record of the species in Tennessee, the other being much further westward, in Cumberland Co.

Panorpa submaculosa Carp.

Hine's collection includes numerous specimens from Ohio, from which the species has not previously been recorded. The following are the localities: Medina Co. (June 28), Coshocton Co. (July 11), Cincinnati (July 13), Sugar Grove (May 30).

Panorpa latipennis Hine.

In the Michigan collection there is a male from Rochester, Michigan (May 27, 1928). This is a very interesting record, since the species has previously been known only from New England, New York, and New Jersey. It suggests that *latipennis* may occur in Ohio, Pennsylvania, and perhaps Indiana.

Bittacus strigosus Hagen.

One male in the Michigan collection taken at Bryson City, North Carolina (July 8, 1931, F. Byers) is the first specimen from the state.

Bittacus pilicornis Westwood.

A large number of specimens were collected by Mr. Browne and the writer at the base of South Mountain, Pittsfield, Massachusetts, during July, 1931. This is the first record of the species in that state, although scattered specimens have been taken in other parts of New England. The insects were flying in the midst of a much larger colony of *strigosus,* covering about an acre.

An Arboreal Nest of Bombus fervidus (Fabricius).—Last September, my colleague, Dr. L. R. Cleveland, told me of being attacked in his garden at Jamaica Plain, Boston, by "bees" gathered near brood-cells that apparently had dropped from a tree. The "bees" proved to be workers and young queens of *Bombus fervidus.* The incident seemed of sufficient interest to warrant further investigation.

I found that the bumble-bees had their nest at the height of some thirty feet, in the branches of a spruce, close to the main trunk. The colony evidently had been started in an old bird's nest, and due to the dense branching of the spruce, was exceedingly well hidden from sight and well protected against wind and rain. Nevertheless, it came to grief, probably owing to the bird's nest being either too loosely built or too old. As the bumble-bee colony grew, pieces of the comb came dropping down to the ground, where they attracted some of the bees, who then attacked at once any intruder. Plath (1922, Psyche, XXIX, p. 200), has pointed out that *B. fervidus* is one of our most vicious bumble-bees.

I have not been able to find a reference to an arboreal nest of *B. fervidus* in the literature. Franklin, Plath and Frison mention no such cases. Putnam, Franklin and Plath found nests of this species on the surface of the ground, one half to one foot below the surface, in stone walls, in stumps, and the like. Moreover, there appears to be only one published record of a North American bumble-bee nesting any considerable height above the ground. L. O. Howard (1918, Ent. News, XXIX, pp. 114–115), writes of a colony of *B. pennsylvanicus* (DeGeer) found at Garrison, Missouri, in an abandoned nest of an English sparrow, in a tall elm tree, twenty or more feet from the ground. Since there are many records of European bumble-bees nesting high up in trees, using for the purpose abandoned nests of birds or mammals, I suspect that similar cases are more frequent in this country than may appear from the literature. They may have been overlooked or not placed on record.—J. Bequaert, Boston, Mass.

NOTES AND DESCRIPTIONS OF NEW CERAMBYCIDAE (COL.).

By Chas. Schaeffer, Brooklyn Museum, Brooklyn, N. Y.

Romaleum mancum Casey.

The different form of elytral apices—the suture at apex only spinose, the outer apical angle angulate—seems to have been the main reason for proposing a name for an apparently individual variation of *rufulum.* The majority of specimens of the latter species have the elytra bispinose at apex, however, a large series of specimens shows that the outer angle is variable, being either distinctly spinose, dentate, angulate or even broadly rounded. Occasionally a specimen occurs which has the outer apical angle of one elytron spinose or dentate and angulate in the other. The sutural spine is apparently more constant and varies very little.

Tragidion texanum n. sp.

Coloration as in *armatum* and also with elytra not corrugated but differs by rather narrower and more elongate form, decidedly longer antennal joints of which the third to sixth are red and black at apex, the seventh to eleventh black; the three longitudinal and very narrow lines on each elytron very plainly visible and the apex of elytra less broadly rounded. Length 23 mm.

El Paso, Texas.

Two females placed in the collection of the late Ottomar Dietz with *armatum.*

Necydalis diversicollis n. sp.

Entirely reddish brown. Head less strongly constricted behind than in the other species; the longitudinal median and sub-apical arcuate impressions very distinct; surface dull, rather closely punctulate, clypeus shining, sparsely punctate. Prothorax near apex and base rather feebly constricted laterally; sub-apical and ante-basal dorsal impressions distinct but not deep, longitudinal median impression absent, a small, shallow impression just above the ante-basal impression at middle; surface between the two transverse impressions shining, nearly impunctate, from a lateral view a few short, erect hairs can be seen, arising from minute punctures; the apical and basal area separated by the transverse impressions dull and sparsely punctate. Elytra slightly wider than the prothorax, about as wide as long; suture from about apical fourth arcuately diverging to apex, lateral margins slightly converging to apical margin and arcuately joining the latter; surface dull, obscurely punctate, humeral callus shining and more distinctly punctate; near suture a distinct longitudinal depression from the inflated apical area to about middle, the inflated apical area extending a short way along the lateral margin; apices somewhat arcuate-truncate. Body below densely punctulate, pubescence very short and feebly visible, pubescence more evident on underside of prothorax and sides of metasternum. Length: 18 mm.

Logan, Utah, July.

A unique female labelled *laevicollis* in the collection of the late Ottomar Dietz. It differs, however, from that species in having shorter and stouter antennal joints which are similar to those of *cavipennis,* the prothorax is wider, less constricted and the lateral tubercles relatively feebly prominent at sides, also the transverse dorsal impressions are less deep; the head is rather feebly constricted behind with genae scarcely prominent.

Pogonocherus californicus Schffr.
= *Pogonocherus pilatei* Van Dyke.

In Bull. Brooklyn Ent. Soc., vol. xv, 1920, p. 46, Dr. Van Dyke described as a new species of *P. pilatei.* However, the description and the following remarks leave no doubt that his *pilatei* is my *californicus* and what he identified as the latter is very likely the species described below.

The unique type of *californicus* is a female and is not very well preserved.

Pogonocherus vandykei n. sp.

Similar to *californicus* in form with rounded elytral apices. Upper surface clothed with pale yellowish-gray pubescence, the tufted tubercles black, the rather long erect hairs on the disk of elytra black, white at sides, and on the head; elytral costae on the disk scarcely evident, the lateral costa on each side more distinct but not strong. Discal and lateral tubercles of prothorax distinct, the latter obtuse. Body beneath and legs with greyish-white pubescence, legs and antennae with long erect white hairs. The underside of posterior tarsi are almost entirely without the short, dense, yellowish pubescence. Length, 7 mm.

Ventura Co., California, July; raised by E. D. Hopkins from *Pinus edula.*

The black tufted elytral tubercles in the unique type are more or less distinctly separated not forming a dark area or fascia below the silghtly depressed, paler area, the dark, subbasal tubercles forming a medially interrupted arcuate fascia.

This species is apparently what Dr. Van Dyke wrongly identified as my *californicus*.

Pogonocherus concolor Schffr.

Dr. Van Dyke has placed this species wrongly as a color variety of what he had identified as my *californicus*. Besides the uniform yellowish-grey surface color, the usual longer hairs on the head and prothorax are almost absent, which on the elytra are black, rather short and sparse with a few longer white hairs laterally, but there are no tufts of hairs on the elytra and only the lateral costa is distinct. All the tarsi are covered below entirely with short, dense, yellowish-grey pubescence.

These characters readily separate *concolor* from *californicus* and *vandeykei*.

When I described *concolor* the specimen was without locality label and was thought to come from California. Later on, however, going over the pages of my personal Henshaw list at home one night I found that I had added *concolor* as a new species with the locality " Lower California (S. Beyer)."

NOTES ON THE METAMORPHOSIS OF THE BRASSOLIDAE (LEPIDOPTERA).

By Marston Bates, Museum of Comparative Zoölogy, Cambridge, Mass.

The literature on the metamorphosis of most tropical Lepidoptera is very scattered, and few summaries exist. For this reason it was thought that a review of what is known of the early stages of the Brassolidae might be of value in connection with a more detailed study of one of the species (*Opsiphanes cassina fabricii* Boisd.). No literature references are included that have not been seen, which means that one or two possibly important papers are omitted. I have to thank Mr. Carl Heinrich for lending me a specimen of the larva of *Brassolis isthmia* Bates; I have not seen larvae of *Eryphanis* or *Narope*; the material used in the other genera is in the collection of the Museum of Comparative Zoölogy.

The family Brassolidae has been reviewed several times in recent years, and general statements on the metamorphosis are included by Stichel (1904 and 1909) and Fruhstorfer (1912), although for the most part these simply restate the observations of Müller (1886). The larvae of six genera have been described: *Brassolis, Caligo, Dynastor, Eryphanis, Narope* and *Opsiphanes.* All of these except *Brassolis* are characterized by the development of spines or horns on the head, an indication for four pairs being present, although (as in *Opsiphanes cassina*) only two pairs may be developed. The body is characteristically thickened in the middle, tapering toward each end; the ground color is either brown or green, and the markings, as in the Satyridae, consist of longitudinal lines. Caudal horns (the "tail-fork") are developed in all genera except *Brassolis.*

The scale-like hairs of the head of the first stage larvae of *Opsiphanes* and *Dynastor* form one of the most interesting features found in the family. Figure 1 shows the form and distribution of these in the larva of *Opsiphanes cassina fabricii.* Müller (1886, p. 210) has discussed the significance of these modified hairs at some length, although he is unable to form any definite conclusion as to their meaning. They are apparently a specialization of the 1st stage larva, serving to accentuate the "poodle-like" appearance of the head. In Müller's species (*O. tamarindi* and *D. darius*) the modified hairs do not persist beyond the 1st stage. In *O. cassina fabricii* we find them present in the 1st, 2nd, 3rd and 4th stages.

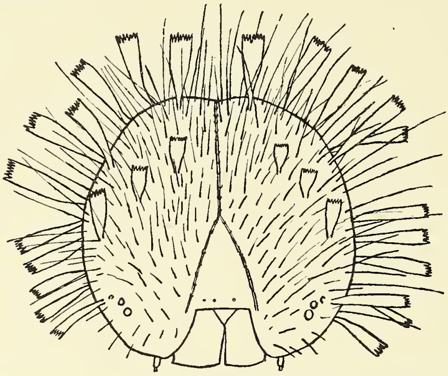


Fig. 1. *Opsiphanes cassina fabricii* Boisd., head of first stage larva.

The larvae of the family Brassolidae can probably best be separated from other butterfly larvae by the arrangement of the crochets of the prolegs, and by the position in which the head is held. The crochets form an ellipse, interrupted only at the outer end, the long axis of which is transverse to the body of the caterpillar: a character that they seem to share with no other larvae of the Nymphalid (*s. l.*) group, although it is identical with the arrangement found in many Hesperidae. The head in this family is somewhat flattened, and held in a more or less horizontal position, so that the dorsal margin becomes caudal.

The larvae of the Nymphalid genus *Charaxes* are strikingly similar to those of many Brassolids, as they have both the cephalic horns and the tail-fork. Without material for comparison it is impossible to decide whether this resemblance is purely superficial. (For a summary of the larval characters of *Charaxes*, see Rothschild and Jordan, 1900, p. 282). The similarity in pattern to the Satyridae has already been remarked; the close relationship between this family and the Brassolids is also shown in the development of the tail-fork. I had thought that it might be possible to interpolate the Brassolidae and other tropical families in existing keys to the larvae of Lepidoptera; but such keys, based largely on that of Fracker (1915), become so unsatisfactory when tropical species are considered that it is better to await a more comprehensive tabulation. The Brassolidae trace to the Hesperidae in the key of Brues and Melander (1932); or, if the proleg character be overlooked, to couplet 97 (p. 253), where they differ from further families in the possession of anal tubercles. Larvae of the genus *Brassolis* are difficult to separate from the Hesperidae on superficial characters.

The following is suggested as a tentative key to the larvae of Brassolidae, as far as known to me:

1. No horns on head .... *Brassolis*
   Horns present .... 2.
2. Body with several, usually 4, mediodorsal spines ...... *Caligo*
   Spines not present, or represented only by short warts ..... 3.
3. Warts developed on mediodorsal line .... *Eryphanis*
   No such warts .... 4.
4. Two or more oval markings on mediodorsal line in place of spines or warts .... *Dynastor*
   No such markings .... *Opsiphane* (*Narope*?)

As I have pupae of only two genera (*Brassolis* and *Opsiphanes*), no general remarks can be made. The relationship, however, seems to be with the Satyridae, where they trace in Mosher's keys (1916).

Genus Brassolis Fabr.

The larvae of several species of this genus are well known, as they feed gregariously on palms, to which they may cause considerable damage. Müller (1886) considered the absence of cephalic horns and the tail-fork in this genus to be a specialization, but to me his reasoning is not entirely convincing.

Brassolis sophorae sophorae Linn.

Cleare, 1915: life history in British Guiana; Rothschild, 1916, p. 314, pl. VI, f. 7, larva, f. 9, pupa.

Food-plant: Palms, including the coconut and *Oreodoxa regia*; at times a pest.

Brassolis sophorae vulpeculus Stich.

Rothschild, 1916, p. 314, larva. Food-plant not mentioned.

Brassolis astyra astyra Godt.

Müller, 1886, p. 179; Rothschild, 1916, p. 315, pl. VI, f. 8, larva.

Food-plant: "palms."

Brassolis isthmia Bates.

Schultz, 1908; Dunn, 1917; Zetek, 1919.

Food-plant: Palms, including *Martinezia caryotaefolia, Oreodoxa regia, O. oleracea, Thrinax spp.* and the coconut; at times very destructive. Zetek reports it also from banana.

Genus Dynastor Westwood.

Dynastor darius darius Fabr.

Müller, 1886, p. 172; Rothschild, 1916, p. 310, pl. VI, f. 13, larva, f. 11, pupa. A larva in the MCZ from Rio de Janeiro seems to be this species.

Food-plants: Pineapple and other Bromeliaceae.

Dynastor napoleon Westwood.

Rothschild, 1916, p. 309, pl. III, f. 5, larva, f. 6, pupa.

Food-plant: Bromeliaceae.

Genus Narope Westwood.

Narope cyllastros Dbl. Hew.

Füller, 1886, p. 178.

Food-plant: *Bambusa.*

Genus Opsiphanes Westwood.

Opsiphanes batea batea Hbn.

Rothschild, 1916, p. 310, pl. V, f. 8, larva, f. 6, pupa.

Food-plant: "a species of palm."

Opsiphanes cassiae cassiae Linn.

Guppy, in Kaye, 1904, p. 226, pl. XVII, ff. 2–2b, 2nd stage, 3rd stage and full grown larva. Food-plant not mentionel.

Opsiphanes cassiae lucullus Fruhst.

Rothschild, 1916, p. 311, pl. V, f. 7, larva, f. 8, pupa.

Food-plant: "Banana."

Opsiphanes tamarindi Felder.

Müller, 1886, p. 170.

Food-plant: "*Musa*" (Banana).

Opsiphanes bogotanus bogotanus Dist.

Rothschild, 1916, p. 311, pl. VI, f. 5, larva, f. 6, pupa.

Food-plant: "Banana."

Opsiphanes invirae amplificatus Stich.

Hayward, 1929. Food-plant not mentioned.

Opsiphanes invirae remoliatus Fruhst.

Rothschild, 1916, p. 311, pl. VI, f. 10, larva, f. 12, pupa.

Food-plant: "Giriva and palms."

Opsiphanes cassina fabricii Boisd.

The following observations on the life history of this species were made at Tela, Honduras, in 1929.

Egg. The butterfly was observed ovipositing about 3 o'clock on a cloudy afternoon. The eggs were laid singly on the underside of the leaves of a palm, *Guillielma utilis* Oerst.

The egg is spheroid, flattened at the base and somewhat less so at the top; 2 mm. in diameter, and of a pale green color. There are 31 rather prominent vertical ribs, which sometimes converge before reaching the top of the egg; these ribs are all connected by fine horizontal lines, thus forming rectangular cells. About the micropyle they abruptly degenerate into an irregular network of fine lines, the space thus formed being small and not noticeable without a lens.

Two days after oviposition, three definite dark brown rings have developed around the egg, although the general color has not changed perceptibly. Nine days after oviposition the egg has assumed a distinctly mottled appearance, irregularly blackish on one side, and with wavy lines, probably following the curve of the larval body, on the other. The egg stage lasts ten days.

Stage I. Width of head, 1.4 mm.; length of body, exclusive of anal horns, 6 mm.; anal horns 1.5 mm. long, with fine setae about 1 mm. longer.

The head is very large in proportion to the body, dark brown, rather shallowly sculptured. The cephalic horns are not as developed as in Müller's figures (*l. c.*, pl. II, f. 30a) for *O. tamarindi,* and would scarcely be distinguishable from the other sculpturing were one not looking for them. The whole head is covered with long, fine, grayish hairs, making what Müller calls the "poodle" type of head. Scattered among these hairs are a few that are curiously modified: shorter than the others, they are flattened, and fringed at the distal end, so as to look much like the scales of the adult wing. Our sketch (Fig. 1), made from the cast head capsule, shows the form and distribution of these.

The body is slender and straight, striped with yellow and red: yellow dorsally, with a fine, dark, medio-dorsal line; a rather broad reddish band subdorsally; below this two more reddish lines, with the rest of the body yellow. The last abdominal segment has two long, dark horns, terminating in fine setae: the so-called tail fork.

Three days after hatching, the reddish bands have become a clear yellow, leaving only a fine reddish line on the lower edge of each. This stage lasts 9 days.

Stage II. Width of head, 1.8 mm.; total length, including anal horns, 12 mm.; length of anal horns, 2.7 mm.

The head is still larger than the body, but not as much proportionally as in stage I. It is greatly changed in shape and position, no longer round, but rather oblong, and held horizontally, so that the dorsal margin becomes caudal. This caudal margin bears a larger, inner pair of horns, a smaller outer pair, and a still smaller, slightly developed pair outside of these. The head is still covered with fine hairs, which show some concentration into a tuft between the ocelli and the mouth. The scale-hairs are still present; Müller states that they have disappeared at this stage in *O. tamarindi.* The head is in general dark, lightening to brown on the sides and around the frontal triangle. The epicranial suture is curiously flanked, just above the front, by two cream-colored dashes which, though small, appear very conspicuous against the dark head.

The body is much as in Stage I: a yellowish green medio-dorsal band, flanked by darker green subdorsal bands, which are in turn bordered ventrally by fine dark lines that run onto the anal horns, and two lighter lateral bands with dark central lines. The body is covered sparingly with fine secondary setae. The underside and prolegs are green.

Stage III. Width of head, 2.4 mm., now not much wider than body, longer in proportion to its width than before, horns proportionally smaller.

The epicranial suture is now enclosed in a light yellow band, which is in line with and similar to the dorsal band of the body. The frontal triangle is entirely included in this yellow. The mouth-parts are a dirty white, as are the sides of the head. The caudal margin of the head and central pair of horns are a very dark brown; the outer horns are more or less colorless. The head is still clothed with hairs as before, widely scattered except between the ocelli and mouthparts; the scale-hairs still persist.

Body much as in stage II, except that the caudal horns have acquired a distinct lavender tint.

Stage IV. Width of head, 3.4 mm. No notes were taken on this stage.

Stage V. Width of head, 4.4 mm.; total length, including anal horns, 47 mm.; length of anal horns, 4 mm.

The head, along the median suture, is yellow; the front is purplish on the sides, with a bright lavender line running to the base of each of the inner pair of horns. The sides, below the outer horns, are whitish; the ocelli are black, the mouthparts whitish, tipped with black. The inner pair of horns is orange, tipped with black, the outer pair whitish. The head is covered with fine hairs, which become longer and more prominent over the ocelli. In this stage, for the first time, the scale-like hairs have disappeared.

The dorsal stripe of the body consists of four fine red lines, inclosing a light greenish area on the medio-dorsal line and white areas on either side. Subdorsally, the body is greenish, granulated with white. The subdorsal band consists again of two fine red lines enclosing a whitish one; the supraspiracular band is the same, the inclosed area being greenish. The spiracles are very small, reddish-brown spots, not distinguishable with the unaided eye. The legs are small, reddish. The caudal horns are reddish brown, heavily granulated with white, and covered with fine white setae; the tips are black.

Stage VI. Width of head, 5.5 mm.; total length (from another specimen), 50 mm.; anal horns, 9 mm. long.

The whole animal has become overcast with gray; the head, along the epicranial suture, is a greenish gray rather than yellow; the outer pair of horns have become concolorous with the stripe that runs to their base, and are tipped more heavily with black. The inner pair of the dorsal red lines of the body has become dark and the outer pair light, red; the other red lines have all become darker, and are not sharply differentiated from the ground-color of the body.

Pupa. The transverse ridge of the head has distinct and rather prominent cephalo-lateral angles, projecting about 1 mm. forward. This cephalic ridge is continued laterally to the second abdominal segment, where it ends, with a small iridescent spot ventral to it. The metathorax is elevated, with a median ridge, distinct but not prominent, which extends caudad to the cremaster and continues forward to the cephalic ridge as a line.

The circular ridge surrounding the anal opening is fairly prominent, composed of tubercles which are largest on either side of the genital opening. The cremaster also has two lateral rows of tubercles. The setae of the cremaster form a ring, with a depression in the center.

Genus Eryphanis Boisd.

Eryphanis reevesii reevesii Westw.

Müller, 1886, p. 175, as *Caligo rivesii.*

Food-plant: *Olyra latifolia; Bambusa.*

Genus Caligo Hübner

Caligo illioneus illioneus Cramer
Cleare, 1926, description and figures.
Food-plant: "Banana."

Caligo illioneus pampeiro Fruhst.
Rothschild, 1916, p. 312, pl. V, f. 1, larva.
Food-plant: "Banana."

Caligo illioneus saltus Kaye
Guppy, in Kaye, 1904, p. 226, pl. XVII, f. 1–1f. (egg and all stages except 4th.)
Food-plant: "Banana."

Caligo prometheus epimetheus Feld.
Rothschild, 1916, p. 313, pl. V, f. 2, larva.
Food-plant; "Banana."

Caligo brasiliensis brasiliensis Feld.
Müller, 1886, p. 174, as *Caligo eurylochus;* Silva, 1907, p. 91, as *Caligo eurylochus;* Rothschild, 1916, p. 313, pl. V, f. 9, larva, f. 10, pupa.
Food-plant: Musaceae (Banana) ; *Hedychium.*

Caligo memnon memnon Feld.
Davis, 1915, description and figures of life history in British Honduras.

Caligo oberthuri oberthuri Deyr.
Rothschild, 1916, p. 314, pl. V, f. 3, larva.
Food-plant: "a palm."

Caligo beltrao Ill.
Müller, 1886, p. 175.
"Food-plant as *C. eurylochus.*" (Musaceae, *Hedychium*).

Bibliography

Brues, C. T., and **Melander, A. L.** 1932. Classification of insects. Bull. Mus. Comp. Zool., Harvard, LXXIII, pp. 1–679.

Cleare, L. D. 1915. A butterfly injurious to cocoanut palms in British Guiana. Bull. Ent. Res., VI, pp. 273–278, pls. VIII–X.

————. 1926. On the life-history of *Caligo illioneus illoneus* Cram. Trans. Ent. Soc. Lond., LXXIV, pp. 361–365, pls. LXXXI–LXXXIII.

Davis, F. L. 1915. The larva and pupa of *Caligo memnon* Feld. Trans. Ent. Soc. Lond., 1915, pp. 198–200, pl. XXIX.

Dunn, L. H. 1917. The cocoa-nut tree caterpillar (*Brassolis isthmia*) of Panama. Journ. Ec. Ent., X, pp. 473–488, pl. XXII, XXIII.

Fracker, S. B. 1915. The classification of Lepidopterous larvae. Ill. Biol. Monographs, II, pp. 1–169, pls. I–X.

Fruhstrofer, H. 1912. Brassolidae, in Seitz, Macrolepidoptera of the World, V, pp. 285–332.

Hayward, K. J. 1929. The caterpillar and pupa of *Opsiphanes invirae* subsp. *amplificatus,* Stich. Ent. Record, XLI, pp. 34–35.

Kaye, W. J. 1904. A catalogue of the Lepidoptera Rhopalocera (butterflies) of Trinidad. Trans. Ent. Soc. London, 1904, pp. 159–228, pls. XVII, XVIII.

Mosher, Edna. 1916. A classification of the Lepidoptera based on characters of the pupa. Bull. Ill. State Lab. Nat. Hist., XII, pp. 13–159, pls. XIX–XXVII.

Müller, Wilh. 1886. Südamerikanische Nymphalidenraupen. Zool. Jahrb., Zeitsch. f. Syst., I, pp. x, 256, pls. I–IV (reprint).

Rothschild, W. 1916. Notes on Amathusiidae, Brassolidae, Morphidae, etc., with descriptions of new forms. Nov. Zool., XXIII, pp. 299–318, pls. III–VI.

————, and **Jordan, K.** 1900. Monograph of Charaxes. (cont'd.) Nov. Zool., VII, pp. 281–524, pls. VI–XII.

Schultz, H. F. 1908. *Brassolis isthmia,* a Lepidopterous insect highly injurious to cocoanut culture in the Panama Canal Zone. Proc. Ent. Soc. Washington, X, pp. 164–167.

Silva, B. R. da. 1907. Lepidopteros do Brasil. Rio de Janeiro, Imp. Nac., 179 pp., 33 pls.

Stichel, H. 1904. Brassolinae. Genera Insect., fasc. 20. 48 pp., 5 pls.

————. 1909. Brassolidae. Das Tierreich, Lief. 25. xiv, 244 pp.

Zetek, J. 1919. The cocoanut butterfly, *Brassolis isthmia,* on banana. Journ. Ec. Ent., XII, p. 465.

BOOK NOTES

Fundamentals of Insect Life, by C. L. Metcalf and W. P. Flint. (Pp. i–xi–1–581, figs. 1–315. McGraw-Hill Book Co., Inc., New York, N. Y. $4.00.)

"Buried in the archives of entomological literature is a wealth of fascinating facts and rich observations that is forever lost to all but a few."

Here in their book, Dr. Metcalf and Dr. Flint set themselves the task of revealing these abstruse and highly technical works to the ordinary reader. This work is really a rewriting of their more voluminous and technical "Destructive and Useful Insects," (also published by McGraw-Hill), as they themselves say, with emphasis on life rather than on its destruction.

Naturally, this work is anthropocentric—that is, it shows us man's understanding of insects; in the nature of things, we may interpret the psychology of insects only in terms of our own human psyche. Even though we have with us the behavioristic psychology, we are far from a perfect—or even an imperfect—understanding of the springs that motivate many insect activities. But so far as possible, this work tends to make the insect world more comprehensible to men.

The authors strike a balanced account between those activities of insects that injure man in his person or in his belongings, and those activities which are of a beneficial and commendable nature from our point of view. As against losses inflicted by insects (expressed in monetary units), of over one and a half billion dollars are set the benefits from insect pollination of plants and crops in over two billion dollars in this one item! Other incommensurable benefits are their food value to other animals, their activities in controlling destructive insects and as scavengers, and in many other less perceptible ways. In fact, insect products useful to man and cropped by him, have a measurable value of over four hundred fifty million dollars, additional to all their other benefits!

In effect (and in interest) this work is a true modern introduction to entomology; and it serves to correlate the larger and more special works of Comstock, Imms, Essig and Folsom into an articulated whole. It has a place in the entomological library along with these standard works.

J. R. T.-B.

INTERNATIONAL NOMENCLATURE STEW

By J. D. Gunder, Pasadena, Calif.

[In the last issue of the Bulletin you were introduced to Dr. Tom, (Dr. E. N. TOM OLOGY). At the time he happened to be playing his well known part in the Zoological comedy called, "Entomological Kow-towing." "Entomological Kow-towing" has always been a popular play, especially with Linnean Zoologists of the Tennessee type and Dr. Tom has been acting the part of chief kowtower for years, in fact he got his start in that company. Doc is a wonderful fellow, has many undeveloped potentialities and is by far THE BIGGEST drawing card and we hope that some day he can put on his own show, under his own name and play the leading part. There is no telling! At any rate, we hope you saw that last issue of the Bulletin.]

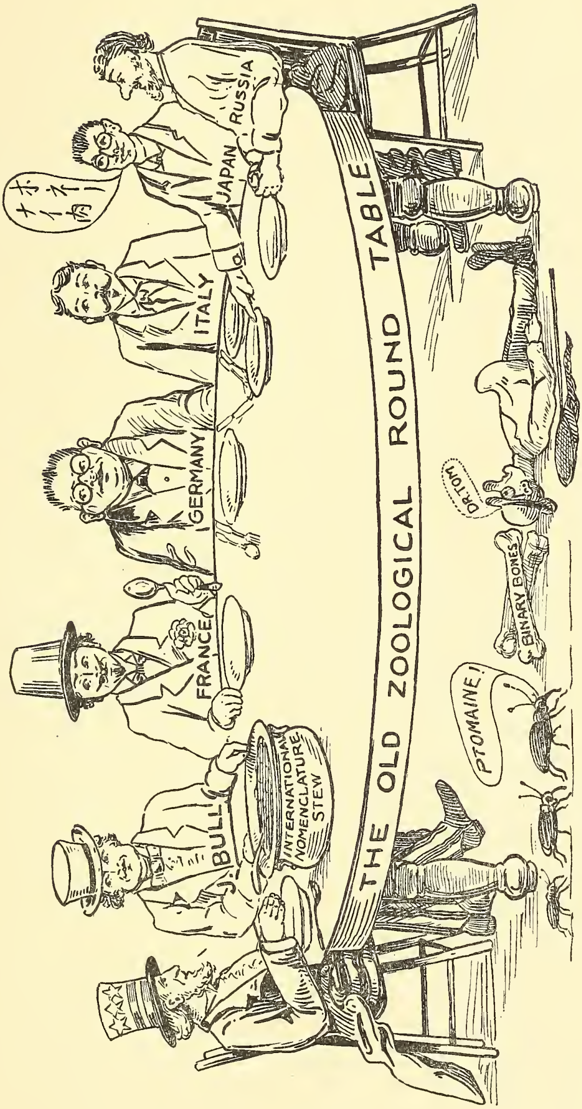
Every so often the Zoologists hold a big formal party or Congress, though of late years these have become more or less informal. They are what you might call "park-your-guns-with-your-hat" and "try-to-get-together" affairs. The banquets are the main attraction and Dr. Tom always manages to attend, though only in the interest of what a majority stockholder might find out. He never gets to sit very near the food and what they serve usually makes him sick. You see they invariably have a kind of stew known as International Nomenclature Stew and poor Tommy has to take what is handed him. Usually its only a couple of oldish bones, binary nomenclature bones which have felt the touch of time, and they don't agree with him at all.[1]

In the picture on the opposite page, we show the regular guests assembled. This was at the recent Padua Congress and we include the pathetic figure of poor old Dr. Tom already laid out with his usual case of ptomaine. The guests had arrived early; also hungry and how they mopped up! They seemed hungrier than usual. No parliamentary rules or procedure when it comes to partaking of good old Padua stew! Now, Uncle Sam and his friend Johnnie Bull are particular about their food. They are used to good stuff at home; so, when Uncle Sam did not dive in like

[1] N. D. Riley, systematic entomologist, of London says, "We overlook the time factor, or perhaps I should say, we cannot include the time factor in any (binary) two-dimensional scheme of classification. The old linear system is of course totally inadequate. Yet if we expect the theory of evolution, then our assessment of any (zoological) group must make allowance for time." (The parentheses are mine.)

the rest with his customary relish, all eyes were upon him. The reason he didn't was that when he first sat down, he thought the odor of the stew was off, somewhat punklike, and besides that he could see the condition of Dr. Tom from where he sat. So he nudged Bull and simply didn't eat, just nibbled a bit; and a feeling that he had been double-crossed came over him. Here is the inside story. It seems that several times before there had been some complaint about the stew and that at Padua, this time, fairly standard cooking had been promised, but evidently the promise, such as it was, had been overlooked and some one had fallen down on the job. Maybe they didn't think so, but they had. Was Uncle Sam going to get sick on poorly cooked stew? Well, I should say not! However, it's just that way with some 'fellers' of late and Uncle Sam is only beginning to find it out. They have a philosophy over there, new to him, which goes like this: if one nation makes a promise to another nation and does not wish to carry it out, all the first nation has to do is to say to itself, "That was a bad promise," and then break it. A strange philosophy, don't you think? Moreover, it's a common saying that, "a bad promise is better broken, than kept." A funny state of affairs, and one which is hard to contend with. I don't mean that we need a diplomatic change either.

But returning to Dr. Tom, what has he got to say? Well, Dr. Tom is an entomologist (I don't mean a democrat exactly!) and he knows that entomology dominates the zoological field and he thinks that it's about time that they hang out a new sign and print a new book which reads—"International Rules of ENTOMOLOGICAL Nomenclature." That would let the Zoological boys have their own backyard to play in for a change. It's a radical idea perhaps, but it's not new. By the way, why not arrange to call that Zoological meeting at Washington as suggested by Dr. C. W. Stiles in his article titled—"Is an International Zoological Nomenclature Practicable?" (Science, Apr. 3rd., 1931, Vol. 73, No. 1892, pages 349–354). The time is about ripe for such a step, as the delegates to the Fifth International Congress of Entomology held at Paris this summer will soon be returning home primed with "bad" Continental ideas and "good" fermentation! Go to it, Dr. Stiles! Round out your thoughts and assemble the clan. After 40 years of Zoological experience, you could well conduct an entomological-zoological or zoological-entomological band. No one else is better situated or suited. Washington would be with you, likewise London and the rest would eventually come tumbling after.



International Nomenclature Stew.—Gunder.
(*Text on opposite page.*)

PROCEEDINGS OF THE SOCIETY

Meeting of January 14, 1932

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, January 14, 1932, at 8.15 p. m. President Davis in the chair, and thirteen other members present, *viz.,* Messrs. Anderson, Ballou, Burke, Engelhardt, Lacey, Lemmer, Moennich, Nicolay, Sheridan, Siepmann, Torre-Bueno, Wilford and Wurster, and Mr. Stecher and a reporter from the *Brooklyn Eagle.*

The minutes of the previous meeting were read and approved as corrected, and Mr. Engelhardt presented the report of the treasurer for 1931.

Mr. Torre-Bueno stated that the annual report of the Publication Committee would be deferred until figures for value XI of Entomologica Americana were available. He also explained that the December number of the Bulletin was being held up on account of the post office regulations requiring that the index be sent as part of the last number of the current volume, and not, as heretofore, as a separate with the first number of the next volume.

Mr. Davis read letters from the Gem Floral Gardens and from Mr. Henry Dietrich. A letter from Dr. Johannsen concerning the group rates on an European tour for entomologists attending the International Congress of Entomology in Paris which would be available if a sufficient number of them showed an interest in it, was read by Mr. Torre-Bueno.

Mr. Wilford, reporting for the nomination committee in the absence of Mr. Schaeffer, recommended that the present officers of the society continue in office. There being no other nominations, Mr. Wurster moved that the nominations be accepted. On motion, the secretary cast one ballot for the re-election of the present officers.

Mr. Siepmann spoke of his trip to Florida during the past November. Most of the collecting was done on Upper Matecumbe Key, a small coral island about two miles long, forty miles off the south coast of Florida. There were very few trees on the island, with the exception of the coconut palms along the beach on the reef side, and a few comparatively low sapodillas. In many places, especially near still, shallow water, the mangroves formed a dense thicket, growing not only on the land, but for some distance into the sea. Because these bushes throw down roots from their branches, they form an almost impenetrable jungle. On the higher parts of the island, the vegetation consisted of low bushes, badly overgrown with ordinary morning-glories, several species of cactus, spanish bayonets, and other sharp thorned plants. Along the roadside the sand burrs grew in great profusion, making it difficult to use a net. In addition, the mosquitoes, which were of small size, but extremely active by day as well as by night; and the red bugs added to the discomforts of collecting.

There was an almost total lack of soil on the island, but wherever the loose, rough coral rock afforded a crevice where some débris might collect, vegetation took root. A few crops were cultivated, chiefly limes and other citrus fruits, and tomatoes, the cultivated plots having a wild and unkept appearance, but nevertheless productive.

Although a large number of specimens was collected during the trip, there was not as much variety as one might expect, due to the absence of trees and soil, and to the complete lack of fresh water. On all of the keys it was necessary to import the drinking water from Miami.

Mr. Siepmann exhibited some photographs of the vegetation, and a few specimens, mostly Coleoptera. A number of the species were Cuban rather than strictly Floridian. The Histeridae, which were determined by Mr. Ballou, included three species: *Hister coenosus, Saprinus pennsylvanicus,* and *Saprinus aeneicollis.* The last named species, of which a number of specimens were obtained, constitutes a new eastern record, the previously recorded distribution being Texas, New Mexico, Mexico, and becoming rare in Central America.

In connection with Florida, Mr. Davis exhibited a box of Coleoptera taken at Cleveland, Florida, on November 14, 1911, about the branches and trunk of a felled pine (*Pinus palustris*). He also spoke of the large pine trees on Big Pine Key, Florida, contrasting with the low, scrubby vegetation on most of the other keys.

Mr. Lemmer exhibited a box of interesting Lepidoptera collected at Lakehurst, New Jersey. The following species were obtained from November 21 to 23, 1931: *Autographa simplex* Gn., *Scepsis fulvicollis* Hbn., *Perigea sutor* Gn., *Perigea vecors* Gn., *Sideridis rubefacta* Morr., *Eriopyga oviduca* Gn., *Jodia* *rufago* Hbn., *Euparthenos nubilis* Hbn., *Zale squamularis* Dru., *Zale minerea* Gn., *Monodes chalcedonia* Hbn., *Caenurgia convalescens* Gn. There were two records for New Jersey, *Amyna octo* a. *axis* Gn. taken October 15, 1931, and *Paectes flabella* Grt. taken May 26 and July 28. The remainder of the material included *Natada nasoni* Grt., on July 11, 1931, and a specimen of *Eparthenos nubilis* with yellow bands on secondaries considerably reduced, on August 6, 1931.

The meeting adjourned at 10.15 p. m.—Carl Geo. Siepmann, Secretary.

Meeting of February 11, 1932

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, February 11, 1932, at 8.10 p. m. President Davis in the chair and fifteen other members present, *viz.*, Messrs. Ballou, Beutenmüller, Burke, Cooper, Engelhardt, Lemmer, Lerch, Moennich, Rau, Schaeffer, Siepmann, Torre-Bueno, Willis, Wilford and Wurster, and Dr. E. Porter Felt, Messrs. Kremberg, Pollard and Stecher, and two reporters from the *Brooklyn Eagle.*

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the monthly report of the treasurer, and Mr. Torre-Bueno reported for the publication committee.

Mr. Torre-Bueno exhibited a copy of the first number of a new magazine, *Stylops,* published by the Entomological Society of London to provide for the proper publication of short taxonomic articles. He also exhibited a copy of the book, *Fundamentals of Insect Life,* by C. L. Metcalf and W. P. Flint, published by McGraw-Hill.

Mr. Engelhardt exhibited a specimen of the clear-wing moth, *Synanthedon bolteri,* collected by Mr. Cooper at Flushing, Long Island, June 6, 1931. This is a new record for Long Island. Mr. Engelhardt added that the species is a willow feeder, and is most likely to be found where beetles had been boring.

Dr. E. Porter Felt spoke on shade tree insects, stating that a considerable number of the insect pests in this country were introduced species. At least fifty-one of the species so introduced are known to be detrimental to shade trees and ornamental shrubs. Such introduced species, in that they are free from certain natural enemies, and that people do not fully realize their destructiveness, represent abnormal hazards. In dealing with them, a number of factors must be taken into consideration. Climatic conditions have considerable effect upon the destructiveness of these insects. The weather affects not only the relative abundance of the insects themselves, but also the resistance of the trees to their ravages. In a wet season, for instance, when trees have sufficient foliage, a moderate infestation of a leaf-feeding species is of considerably less importance than in a dry season, when the trees have developed but little foliage, and in such cases even a moderate infestation can cause serious injury or even the death of the tree.

The defoliation of a tree by leaf-feeding insects does not necessarily kill it, but it lowers its vitality, and opens the way to further injury by borers and fungus diseases. While a single defoliation is of lesser importance, the defoliation of a tree in two or more successive seasons, or by two broods of the same insect in one season, or by the combined attacks of two species of insects at once, is very likely to result in the death of the tree.

In connection with his subject, Dr. Felt spoke of some of the more important shade tree pests. Among them is the elm leaf beetle, an introduced species which defoliates the trees. It is of considerable importance as a shade tree pest, since the elm has been widely used for planting along city streets.

The Japanese beetle is another introduced species now found in many parts of the Eastern United States, and likely to spread further. It is particularly difficult to control because it is a general feeder, attacking many other plants besides shade trees. The adults are active insects, flying about a great deal, often alighting in cities and in the vicinity of railroads, sometimes resulting in their being transported for a considerable distance.

The European willow leaf beetle, also feeding upon foliage, produces three generations annually. It not only causes the tree to change from a beautiful bright green to dull gray in color, but also opens the way for the willow scab fungus. Most people do not sufficiently value willow trees to take much care of them, and this neglect of some of the trees promotes the infestation of others. The species is now found in southern New England, New York, New Jersey, Pennsylvania and Maryland.

Two species of leaf miners attack birch trees. The first, prevalent in New England, New Jersey and Pennsylvania disfigure the foliage, but is not very serious. The second species was originally introduced in the maritime provinces of Canada, and thence spread to Maine and the Adirondacks. It works more in the old leaves and nearer the base, and is a serious foliage pest in the north woods.

The Hickory Leaf Stem Gall, a species of *Phylloxera,* is somewhat local in distribution, some trees being infested, and others not. The eggs hatch at about the time the hickory buds start, and the little insects go beneath the bud scale, where their action causes galls to develop within the tissue before the leaf is pushed from the bud. It can be controlled by a dormant spray before the bud starts, of a miscible oil or of a nicotine-molasses-soap solution.

Dr. Felt said that people are not recognizing the importance of these destructive insects, and that most communities will not take steps to protect their shade trees until some of them have been damaged beyond repair.

Mr. Davis said that the elm leaf beetle was not very destructive on Staten Island during the past few years, but that the willow beetle was quite common. The Leopard moth was also sometimes locally common.

Mr. Moennich, speaking for the field committee, suggested a summer field trip, which would also serve to bring the members together during the interval between the spring and fall meetings.

The meeting adjourned at 10.15 p. m.

Carl Geo. Siepmann,
Secretary.

Vol. XXVII OCTOBER, 1932 No. 4

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

BROOKLYN ENTOMOLOGICAL SOCIETY 1872

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
CARL GEO. SIEPMAN GEO. P. ENGELHARDT

Published for the Society by the
Science Press Printing Co.,
Lime and Green Sts., Lancaster, Pa.,

Price, 60 cents Subscription, $2.50 per year

Mailed October 8, 1932

Entered as second-class matter January 21, 1919, at the post office at Lancaster, Pa., under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

CONTENTS

Bulletin of the Brooklyn Entomological Society

Published in
February, April, June, October and December of each year

Subscription price, domestic, $2.50 per year; foreign, $2.75 in advance; single copies, 60 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE–BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXVII October, 1932 No. 4

THE PENNSYLVANICUS GROUP OF HARPALUS.

By Melville H. Hatch, Seattle, Washington.

Both of the existing studies of this group, by Blatchley (Col. Ind. 1910, p. 180–183) and Casey (Mem. Col. V, 1914, p. 77–88; XI, 1924, p. 97–100), are so unsatisfactory that I was led to attempt the reanalysis of the species present in my collection. Blatchley based his separations on color, the form and relative proportions of the pronotum, and the punctation of the female elytral interstriae. The various shapes of the pronotum are vaguely defined; moreover, there is no species in which the pronotum is not somewhat narrowed behind. Casey effected his major divisions on the punctation of the female interstriae, the fineness or coarseness of the punctation and the degree of deplanation of the posterior angles of the pronotum. The first character does not apply to males and the second is difficult to estimate and is, I believe, highly variable.

In accordance with his usual custom, Casey described a large number of species founded on slight differences in size and proportions. In my opinion these are all to be regarded as varieties or synonyms. Taxonomy loses rather than gains by the sort of analysis that Casey attempted. While there are, undoubtedly, in nature genuine species to be distinguished only by the vague distinctions that Casey insisted upon, such species are not to be detected by ordinary methods of taxonomic analysis. We can well afford to assume that slight differences in size and proportion constitute individual variation until detailed biological investigations shall have shown that the organisms concerned possess indubitable and constant differences in life-cycle or habitat or exhibit kyesamechania, which is to say germinal incompatibilty. For the present, therefore, I distribute Casey's species as follows, either as varieties or synonyms.

With *erythropus* Dej.: *rufopiceus, deludens, effetus, fenisex, admissus, excubans, ? cupiens* Csy.

With *compar* Lec.: *liobasis* Chd., *pubitarsis, nactus, ? feroculus, paratus* Csy.

With *longior* Kby. (*longicollis* Lec.): *texanus, delosus* Csy.

With *vagans* Lec.: *actiosus, latescens, ? immixtus* Csy. *Haldemani* Csy. can stand as a variety with the sutural interval abruptly impunctate.

With *pennsylvanicus* DeG.: *? convivus* Lec., *mormonicus, ? thoracinus, ? protractus* Csy.

I have been unable to recognize *convivus* Lec. in the following study and my interpretation of *faunus* Say is different from Casey's. Only localities from which I have seen specimens are cited. In general each species seems to have a wide distribution east of the Rocky Mountains. The elytral and pronotal punctures bear minute setae which are invisible even under the higher powers of the Greenough binocular unless the surface of the body be covered with a thin film of moisture; thereupon the setae distort the surface film in such a manner as readily to reveal their presence.

Definition of group:—Pronotum flattened with more or less depressed, feebly foveate, densely punctate, rounded hind angles; pronotum widest near middle, base wider than apex; elytra without dorsal puncture, apex sinuate externally, not dentate; mentum toothed; dorsum piceus, rarely (probably due to immaturity) more or less rufopiceus; venter piceus to rufous; legs pale; abdominal segments not densely punctate at sides or base; length 10.2–17 mm.; North America east of eastern Washington, Utah, and Arizona.

It is probable that Csiki (Col. Cat. 121, 1932, p. 1121) is right in associating the members of this group with the subgenus *Pardileus* Gozis. The most important feature for separating *Pardileus* from *Pseudophonus* Mots. then becomes the absence (*Pardileus*) or presence of evident elytral pubescence.

Key to Species

A[1]. Elytral striae finely punctulate; lateral margin of pronotum feebly sinuate or subparallel to very feebly arcuate behind; basal bead entire or interrupted at middle, the basal gutter impunctate or finely punctate; pronotum between basal fovea and lateral margin evidently convex, moderately punctate; interstriae (male) impunctate or (female) with the eighth finely punctate and the seventh with and the fifth usually with scattered punctures; length 12–15 mm.; Mass., ? N. Y., W. Va., Tenn., Mich., Ill., Ark., Okla., Kans., S. D., N. D. .... *faunus* Say

A². Elytral striae impunctate; lateral margins of pronotum evenly or subevenly arcuate and more strongly convergent behind.

B¹. Elytra, including the eighth interstria, impunctate; basal pronotal bead entire, rarely interrupted at middle, the basal gutter impunctate or finely punctate; hind angles of pronotum with coarser and finer punctures intermixed, the area between the fovea and the lateral margin deplanate or somewhat convex; length 11.5–12.5 mm.; Mass., N. Y., Ohio, Mich., Ill., Iowa, Okla., S. D., Mont. (Mont. St. Coll.), *erythropus* Dej.

B². Eighth interstria punctate.

C¹. Basal pronotal bead entire,[1] at times interrupted at middle.

D¹. Basal pronotal bead delimited by an impunctate or finely punctate gutter; hind angles of pronotum more or less finely punctate.

E¹. Eighth interstria only feebly punctate throughout, the other interstriae impunctate or with a few scattered punctures or with a few scattered punctures towards the base, these punctures never arranged in definite longitudinal series along the margins of the interstriae; basal pronotal fovea vague, the surface between it and the lateral margin feebly convex; length 11.5–16 mm.; Mass., W. Va., Ohio, Mich., Ind., Ill., Ark., Okla., Kans., Nebr., Minn., S. D. *compar* Lec.

E². Fifth to eighth interstriae more or less punctate throughout, the others impunctate or with a few scattered punctures or with a few punctures towards the base some of which may be arranged in definite longitudinal series along the

[1] Single specimens of *vagans* and *compar* are exceptions to this, but their identity is otherwise established by their more finely punctate posterior pronotal angles—very much so in *compar*—and their elytral punctation.

margin of the interstria; pronotum less transverse than usual in the group, the basal foveae more or less evident, the surface between the fovea and the side margin deplanate or evidently convex; length 12–13 mm.; Penn., Mich., Ill., Iowa, ? Okla. . . . . *longior* Kby.

D². Basal pronotal bead less definitely delimited and by a coarsely punctate gutter, rarely feebly interrupted; elytral interstriae (female) all densely punctate or with the sutural or the sutural and third interstria sparsely punctate; elytral interstriae (male) with the fifth to eighth interstriae more or less punctate throughout, the other interstriae more or less broadly punctate towards base and with punctures arranged in definite longitudinal series along the margins of the interstriae; pronotum with lateral margins somewhat more strongly arcuate than is usual in the group, the hind angles more coarsely punctate, the basal fovea more or less evident, the surface between the fovea and the side margin deplanate or feebly convex; length 14–17 mm.; Conn. (S. D. St. Coll.), Mich., Ill., Ark., Okla., Kans., S. D. (S. D. St. Coll.). *vagans* Lec.

C². Basal pronotal bead interrupted at sides, the basal gutter coarsely punctate, some of the intervals between the punctures of the gutter being more or less continuous with the surface of the bead; basal bead obsolete at middle about one half the time; hind angles of pronotum more or less coarsely punctate, the fovea evident, the surface between the fovea and the side margin deplanate or feebly or strongly convex; interstriae six and seven with more or less extensive, the other interstriae with shorter basal series of marginal punctures; interstriae four to seven with or without more or less densely placed discal punctures, these likely to be more prominent in the female; length 12–17 mm.; Vt., Mass., Conn., Ont., Mich., Ind., Ill., Ala., Ark., Okla., Kans., Iowa, Minn., S. D., N. D., Colo., Mont., Id., Utah, E. Wash. *pennsylvanicus* DeG.

NEW AND RARE RECORDS OF LEPIDOPTERA FROM THE U. S.

Lakehurst, N. J., July 1–8, 1931. *Ambia striatilis* Dyar—Placed in U. S. National Museum.

Meskea subapicula Dyar (recorded from Mexico). Useppa Isl., Florida (Collector H. J. Erb) a record for the United States. Placed in U. S. National Museum.

Graeperia indubitans Wlk. 1 ♂. Collected by Mr. G. P. Engelhardt. Mobile, Ala., August 25. Only known from U. S. from 1 ♂ from Kerrville, Texas, in Barnes Coll.

Heliothis chloropha Hbn. 1 ♀ (Mr. Engelhardt) Whistler, Ala., September 22, 1930.

Tarache terminimaculata Grb. 1 ♂ (Mr. Engelhardt) Royal Palm Park, Fla., April 10, 1930.

Cerura candida Lint. 1 ♂ (Mr. Engelhardt) Royal Palm Park, Fla., April 10, 1930.

Pygoctenucha funerea Grb. 1 ♂ (Mr. Engelhardt) Jemez Springs, N. M., July 2, 1929.

—Frederick Lemmer, Irvington, N. J.

A NEW PLATYGERRIS WITH NOTES ON P. CAERULEUS CHAMPION (GERRIDAE).

H. B. Hungerford, Lawrence, Kansas.*

In studying some recent acquisitions to the Snow Entomological Museum I find two new forms. One of them is a new species and the other the undescribed male and wingless form of *P. caeruleus* Champion. My appreciation is here expressed to Mr. W. E. China of the British Museum for his kindness in comparing my material with types in his charge.

Platygerris asymmetricus sp. n.

Size: Length of males 7 mm., females slightly less; width of males slightly less than 3 mm. and females slightly more at widest place. (Wingless form.)

Color: Bluish black or greenish black above covered more or less by a silvery pubescence. A median longitudinal dark stripe, more or less faint on thorax merging into a dark area on distal third of mesonotum, similar dark stripe extending from behind each eye along lateral margin of mesonotum to bifurcate at the rear, the inner branch fusing with the dark area on distal third of mesonotum and outer branch joining a similar band on the lateral margin of mesothorax. A faint median tan line on anterior two-thirds of pronotum. A tan spot on vertex between the eyes. Venter silvery pubescent. Antennae, beak and legs dark, except base of anterior femora which are tan at base. Prosternum and acetabula light tan beneath.

Structural Characteristics: Antennal formula[1] of male 1st : 2nd : 3rd : 4th : : 56 : 20 : 14[2] : 28. Eyes longer than the lateral margin of the prothorax. Anterior angles of mesothorax rounded but slightly sloping, lateral margins slightly divergent in both sexes. Length of pronotum on median dorsal line is to length of mesonotum as 3.5 : 12 (♀). Pronotum a little longer relatively in the male. On the metanotum of the female there is an inverted V-shaped ridge with a short protuberance at its apex. The legs of usual form. Anterior femur stout, depressed on front side of

---

* Contribution from the Department of Entomology, University of Kansas.

[1] Measured with Zeiss binocular 1 oculars and A_2 objectives.

[2] Includes tiny basal ring segment.

basal half, especially in the male, a few stout hairs beneath, a trifle longer than the mesonotum on its median line. Tibia as long as femur, curved on distal half, its tip produced beneath the base of tarsus. First tarsal segment one-third as long as the second. Intermediate femur one and one-half times as long as the body. Tibia and tarsus somewhat flattened, the tibia slightly curved and tarsus twisted one-fourth of a turn. Tibia about one-third length of femur and a little longer than the tarsus (13: 11). First tarsal segment slightly more than three times the second. Posterior femur slightly longer than intermediate and four times as long as its own tibia. Tibia two and one-half times as long as its tarsus. First tarsal segment about twice the second. In the female the abdomen attains the tip of the posterior trochanters and the connexivum on the right side is terminated by a finger-like process as long as the fifth abdominal tergite, while on the left side this is replaced by a protuberance on the lateral flap or plate. Two transverse antemarginal brushes are present on the last abdominal tergite. In the male the genital sements are subequal in length to the abdomen, the abdomen surpassing the posterior coxae by half the length of the last segment. The first ventral abdominal segment longer than the following four combined. Last ventral abdominal segment deeply depressed, rear margin incised and margined with hairs. The first genital depressed beneath and the rear margin produced into a long spiniform process on the left of the median ventral line. The second genital also asymmetrical, the dorsal portion armed on the left side at the base beneath with a spiniform process lying to the left of the one above and a little shorter.

Described from a long series labeled "Rio Virilla, Costa Rica, C. A., Dec. 26, 1931, Heinrich Schmidt." Holotype, allotype and many paratypes in the Francis Huntington Snow Entomological Museum, University of Kansas, Lawrence, Kansas. Paratypes also in the U. S. N. M., and the British Museum.

Comparative Notes: This species might well be mistaken for *Platygerris depressus* White, and was so determined by me until I discovered that the females consistently lacked the left spiniform process at the end of the abdomen while the specimen figured by Dr. Champion has two such processes of equal length. Since Champion studied one of White's types I presume his specimens from Teapa in Tabasco are *P. depressus* White although White's material came from Brazil. Mr. W. E. China has compared specimens I sent to him with Champion's material and reports, "With regard to the *Platygerris* spp. your *P. depressus?* is very closely allied to *P. depressus* Champ. (et B. White?) from Teapa, Tabasco, and if it had not been for the distinct difference in the ♀ processes, I should have regarded them as identical. A close examination reveals the fact that Champion's species is distinctly smaller with the genital segments in the male distinctly shorter and more slender. There are slight differences in the shape and length of the spurs of the eighth and ninth abdominal segments which cannot be described without dissection and clearing. The easiest character by which to distinguish the males is the length of the second antennal segment. In Champion's species it is relatively much shorter, that is it is about equal in length to width between the eyes posteriorly, and more than one and a half times as long as the third segment, whereas in your species it is distinctly longer than the width between the eyes posteriorly, and less than one and one-half times the length of third segment. The relative lengths of antennal segments is as follows: *P. depressus* (B. White?) Champ.: 41:16:10:23 *P. depressus?* Hungerford (=*P. asymmetricus* Hungerford): 56:20:14:28."

Platygerris caeruleus Champion

Champion: Biologia Centrali Americana Heteroptera, Vol. II, p. 157. Tab. IX, Fig. 25 ♀.

The type of this species is a winged female but wingless female specimens of my series are believed to be this species. I have 29 specimens of this species, all wingless. There are 14 males in the lot and distinguished by very long genital segments. A description of these morphotypes follows:

Size: Length of male 9.9 mm., female 8.4 mm.; width of male 2.8 mm., of female 3.3 mm.

Color: Black with greenish or bluish green lustre, especially on the pronotum, mesonotum and metanotum which are shiny in many specimens. Sparse silvery pubescence especially on the sides, silvery pubescent beneath. Tan to horn markings as follows: a spot on vertex between the eyes, a slender median longitudinal stripe on pronotum, prosternum, coxae and acetabula beneath, venter of female abdomen and lateral streaks on first genital of male. Antennae and legs black with sparse grayish pubescence especially on anterior femora.

Structural Characteristics: Antennal formula of male: 1st: 2nd: 3rd: 4th:: 72: 26: 20: 31. Eye not quite as long as lateral margin of prothorax. Anterior angles of mesothorax nearly truncate, lateral margins nearly parallel especially in the male and on the anterior two-thirds. Length of pronotum on median dorsal line is to length of mesonotum at 5.5 : 16 (♀) ; 5.2 : 13 (♂). Metanotum without the ridge described for *P. asymmetricus* Hungerford. Legs of usual form. Anterior femora stout, depressed on front side of basal half, especially in the male, a few stout hairs beneath, a little longer than mesonotum on its median line. Tibia not longer than the femur, (actual measure not appearance) not as curved as in preceding species, the tip produced beneath the base of the tarsus. First tarsal segment one-third as long as second. Intermediate femur one and one-fourth as long as body in female, a little less in the male. Tibia and tarsus lightly flattened. Tibia nearly one-half the length of femur in female, (a little shorter in male) and longer than the tarsus. First tarsal segment slightly more than three times the second. Posterior femur longer than intermediate femur and less than three times as long as its own tibia. Females with a fringe of hairs longer than the diameter of the femur on the inner margin near the base. Tibia twice as long as its own tarsus. First tarsal segment about twice the second. In the female the abdomen slightly surpasses the tip of the posterior trochanters and the connexivum is not terminated by finger-like processes. The last abdominal tergite lacks the hair tufts. The first genital tergite of female is asymmetrical, its rear margin bearing a short somewhat curved spiniform process. In the male the genital segments are conspicuously elongate, more than one-fourth the entire length of the insect and nearly twice as long as the abdomen (9 : 5). The abdomen is narrow, parallel sided and nearly attains the distal end of the posterior trochanters. The first ventral abdominal segment equals following four combined. Last ventral abdominal depressed, rear margin incised and margined with hairs. First genital very elongate, depressed above and below on anterior half, larger on posterior half. Caudal margin not produced. The second genital asymmetrical the dorsal portion armed on the left side at the base beneath with a large spiniform slightly curved process, plainly visible from above.

Location of Types: These morphotypes deposited in the Francis Huntington Snow Entomological Museum. Specimens of this series have been sent to the British Museum.

Data on Distribution: This morphotype series comes from Rio Virilla, Costa Rica, C. A., and was taken in December.

The three species of Platygerris known to me may be separated by following

KEY

A. Females without finger-like processes extending from last connexival segment. Males with long genital segments (more than one-fourth the length of the insect) *P. caeruleus* Champ.

AA. Females with finger-like process extending from last connexival segment, at least on right side. Males with genital segments only about one-sixth length of insect.

B. Females with finger-like processes extending from last connexival segment on both sides. Males with second antennal segment about equal in length to width between the eyes posteriorly .... *P. depressus* B. White.

BB. Females with finger-like process extending from last connexival segment on right side only. Males with second antennal segment longer than the width between the eyes posteriorly .... *P. asymmetricus* Hungerford.

Omosita discoidea in New York.—Six specimens of this beetle were collected by Mr. Lionel Lacey at Pelham, New York, on April 10, 19, 21 and 25, 1931. This is a new record for the state, and together with the New Jersey record of a single specimen (Bull. Brook. Ento. Soc. XXVII, p. 49–50) indicates that this species is well established in the eastern United States.—CARL GEO. SIEPMANN, Rahway, N. J.

A PECULIAR TYPE OF DISTRIBUTION OCCURRING AMONG SOME DIPTERA-NEMATOCERA IN JAPAN AND NORTH AMERICA AND A HYPOTHESIS OF ITS ORIGIN.

By Teiso Esaki, Fukuoka, Japan.

Among some Diptera-Nematocera recently discovered in Japan, chiefly by Alexander and Kitakami, there is a series of genera, such as given below, which are otherwise known to occur only in North America.

Blepharoceridae—*Philorus, Bibiocephala, Curupira.*

Ptychopteridae—*Bittacomorphella.*

Fungivoridae—*Diomonus.*

Besides these genera, *Deuterophlebia* (Deuterophlebiidae) is also a genus worthy of mention, which occurs, so far as known to science, only in the Western United States, Japan, and Central Asia. Such a type of discontinuous distribution is also shown by other insects, although the known examples are still few in number.

These Nematoceran families were (1) phylogenetically as equally well differentiated in the beginning of the Tertiary Period as at present, and all these families are represented by actual fossils as early as the Eocene Epoch; (2) and ecologically the Blepharoceridae are strictly confined to mountain streams (larvae and pupae) or their surrounding areas (imagines). The genera of the other families mentioned above are also found exclusively in the same places as are the Blepharocerid flies, although their earlier stages are not aquatic. In other words, these insects are ecologically very confined ("Stenobiotop") and their distributional power is thus very restricted.

Explanations of this type of distribution can not be carried out so far as the "Pendulationstheorie" (Simroth) or the "Relikten-theorie" is concerned. However an explanation may be possible if the "Verschiebungstheorie" (Wegener) is applied. The following data on which the present explanation is based are taken from A. Wegener: Die Entestehung der Kontinente und Ozeane, 3, Auflage, 1922, and W. Köppen and A. Wegener: Die Klimate der geologischen Vorzeit, 1924.

In the Tertiary Period, Eastern Asia and North America were completely continuous, and in the Eocene and Oligocene Epochs the distance between them was much nearer than at present. The north pole was then in Alaska and during the Miocene and Pliocene Epochs it moved gradually to the northeast reaching the extremity of its movement in this direction at the beginning of the Quaternary Period. At this time Hokkaido was situated at about 30° N. in latitude. Those insects developed during the Eocene and Oligocene Epochs in North America were gradually distributed to the west, and this migration might have been accelerated by the ascension of the latitude in North America and the descension of the same in Eastern Asia. To the west of Japan, which was then still continuous with the continent, there was a vast desert until the beginning of the Quaternary Period, and the distribution of the insects in question was thus interrupted beyond the eastern coast (including Japan) of the Asiatic Continent, and only a restricted number of them succeeded in reaching as far as Central Asia through Southern China and the Himalayan districts. *Deuterophlebia* and *Epiophlebia* (Odonata: Epiophlebiidae) may surely belong to this type of distribution. In the Quaternary Period, glaciation visited North America about five times, and at its maximum was extended from the southeastern part of Alaska, all of Canada, and as far south as the middle of the United States (Nebraska, Kansas, Missouri, Indiana, Ohio, and Pennsylvania). At that time the stream-fauna was undoubtedly driven southwards and was destroyed in the frozen districts. However, this fauna has now recovered and reaches northward as far as New England and a part of Canada, thus forming this peculiar type of discontinuous distribution.

Amalus haemorrhous Hbst. in Massachusetts.—The first appearance of this small European weevil in North America is recorded from Syracuse in the New York List, but without any date. A specimen was taken by sweeping in Sherborn, Mass., on June 5, 1932; its identity was established through the kindness of Mr. H. C. Fall. I now find a smaller and darker specimen in my box which was taken by sweeping at Hopkinton, Mass., on June 27, 1926.—C. A. Frost, Framingham, Mass.

NOTES ON BUTTERFLY MIGRATION.

By Harold O'Byrne, Webster Groves, Missouri.

There is a voluminous literature on the migration of butterflies, but as the published records refer to many different species, our knowledge concerning most of them remains more or less fragmentary. The problems connected with this interesting behavior can be solved only with the aid of the accumulated data from many observations, and the following notes are offered with that end in view.

Aglais californica Bdv. A very extensive migratory flight was observed by Mr. K. M. Fender, of McMinnville, Oregon, who kindly sent me the following data. The flight was observed at Crater Lake, Oregon, on August 15th and 16th, 1930. Unidirectional flight commenced at about noon on each day and continued until nearly six P. M. The butterflies were flying in a general northerly direction along the top of the range, at an altitude of about eleven thousand feet above sea-level. The distance between individual butterflies was usually from three to six feet, and their flight was at a height of from four to six feet above the ground. The insects avoided such obstacles as large boulders by flying around them, not over them. Females seemed to be slightly in excess; no mating nor ovipositing were noted. In the mornings the butterflies remained at rest among the pines and hemlocks, though a few would fly about haphazardly in the immediate vicinity of their resting places. This morning inactivity might have been due to temperature or wind conditions, but data on these are lacking. Mr. Fender states that such migratory flights of this species have occurred before in the same region, though they are infrequent events, and seldom so prolonged as the present instance. Wallis, '12, and Webster, '13, have reported similar flights of the same species.

Catopsilia philea Joh. Besides my own observation of this species in Missouri (O'Byrne, '31), occurrences of it in 1930 at three other widely separated localities in the North have been recorded; these are Wisconsin (Dornfeld, '31), Connecticut (Haskin, '31), and Pennsylvania (Tietz, '31), and they indicate that extensive migration occurred during the summer of 1930. Observers in southern localities may be able to enlighten us as to the extent to which the drought of 1930 affected vegetation, particularly the food plants of this species (*Cassia* and other legumes), in the South, or whether unusual abundance or overcrowding took place.

Eurema mexicana Bdv. Occasional solitary and much bedraggled butterflies of this southwestern species appear in the vicinity of St. Louis, Missouri, late in the fall. Several local collectors possess such specimens; the most recent record is one captured by Dr. E. P. Meiners, of St. Louis, at Ranken, Missouri, on October 13, 1931. The appearance of so frail a butterfly hundreds of miles away from its usual haunts may be due to favorable winds, although Lutz, '27, considers the flight of insects as being more frequently against the wind than with it. He suggests, however, that even when they fly against the wind, negative progress in the direction of their flight can be made. There are a number of published records of migration in other species of the genus *Eurema*. Many are referred to by Williams, '30, including *E. lisa* Bdv. & Lec., *nicippe* Cram., *deva* Dbl., *albula* Cram., *persistans* Butl., and *lydia* Felder, in North and South America, besides six other species in the Old World. Some of these have been seen migrating in enormous numbers. Because so many species of this genus show migrating propensities, and because of the unusual occurrence of *mexicana* in the St. Louis region, I regard it as a migrant here, and not a permanent part of the local fauna.

Lerodea eufala Edw. This is a denizen of the Gulf States, although occasional specimens have been seen in the North. Brower, '30, reports it "uncommon" near Willard, Missouri; records near St. Louis are extremely rare, and it has been seen but once by the writer—on November 4, 1931, when three specimens, a male and two females, were taken at Ranken, Missouri. All local records are late autumn ones; the absence of individuals belonging to the first brood makes it very probable that our specimens are strays from the South.

Calpodes ethlius Cram. The wandering habits of this tropical species are well-known, and there are many records of its northern occurrence, especially along the Atlantic Coast. Among these are Norfolk, Va., West Raleigh, N. C., West Grove, Pa., Washington, D. C., and others, mentioned by Chittenden, '12, two New York City records cited by Williams, '20, and West Farms, N. Y., referred to by Holland, '31. Mr. R. C. Lange, of Webster Groves, Missouri, supplies the following data on the occurrence of this species in Webster Groves. He found ten mature larvae on *Canna* on July 22nd, 23rd, and 29th, 1927. The first one pupated on July 25th, and the butterfly, a female, emerged on August 10th. The others emerged between August 11th and 15th. No one seems to have captured the adults in this locality. In connection with the probable migration of this butterfly, Chittenden, '12, found that the larvae and pupae were killed by frosty weather in Washington, D. C., but he suggests that the species may be extending its distribution northward by obtaining footing in greenhouses where *Cannas* are grown. In the absence of definite information regarding such establishment of it in the North, and in the light of what is known of its migrating habits, its occurrence in Missouri is best interpreted as migrations of individuals from the South, which breed freely, but whose offspring subsequently perish from the cold of winter.

All but one of the foregoing records belong to the years 1930 and 1931, years that are memorable for unusual captures of butterflies in many parts of the country, far astray from their proper localities. Both of these years were marked by wide-spread and long-continued drought. It is difficult to establish a direct relation between high temperature, low humidity, or both, and a "wanderlust" in butterflies that would lead to long migrating flights. An indirect relation can be seen in the effects of drought conditions upon vegetation, resulting in overcrowding; I have also suggested overcrowding in connection with the migration of *Dione vanillae* Linn. (O'Byrne, '32). Under these extreme conditions, the female butterflies may not be able to find plants on which to deposit their eggs, or there may be an insufficient amount of suitable foliage to enable their progeny to reach maturity. In such a situation, only migration of the females could insure the perpetuation of the species. Failure of plants for food for the young could hardly impel the males to migrate; but since it is known that males do migrate in certain species, it is probably for the purpose of mating. When migration is not coincident with a shortage of food plants, the causes underlying it are more difficult to ascertain, and the solution of this problem demands further investigation.

Literature Cited

Brower, A. E. 1930. A list of butterflies of the Ozark region in Missouri. Ent. News, xli: 286–289.

[1] Ent. News, 1932, vol. xlii : 45.

Chittenden, F. H. 1912. The larger canna leaf roller. U. S. Bur. of Ent., Circ. 145.

Dornfeld, Ernst J. 1931. Some unusual locality records. Ent. News, xlii: 287.

Haskin, J. R. 1931. Some unusual occurrences of butterflies in Connecticut. Ent. News, xlii: 201.

Holland, W. J. 1931. The butterfly book, revised edition, p. 399. The same reference appears on p. 356 of the original edition, 1898.

Lutz, F. E. 1927. Wind and the direction of insect flight. Amer. Mus. Novitates, no. 291.

O'Byrne, Harold. 1931. A recent occurrence of Catopsilia philea in Missouri. Ent. News, xlii: 15.

——————. The migration and breeding of Dione vanillae in Missouri. Ent. News, xliii: 97–99.

Tietz, H. M. 1931. Catopsilia philea in Pennsylvania. Ent. News, xlii: 279.

Wallis, J. B. 1912. Notes on Vanessa californica at Peachland, B. C., in 1912. Can. Ent., 44: 368–369.

Webster, F. M. 1913. The disastrous occurrence of Vanessa californica in California and Oregon during the years 1911–1912. Can. Ext., 45: 117–120.

Williams, C. B. 1920. Records of insect migration in tropical America. Trans. Ent. Soc. London, 1920: 146–165.

——————. 1930. The migration of butterflies: 130–133.

An Interesing Northern Record.—While collecting on the side of a low mountain in Antrim, N. H., on June 14, 1932, I was greatly surprised to find a specimen of *Gnorimella maculosa* Knoch clinging to a leaf of a maple-leaved *Viburnum* which was then in flower. The day was cloudy and damp and there were few beetles on the flowers.—C. A. Frost, Framingham, Mass.

ADDITIONS TO THE NEW YORK STATE LIST OF INSECTS

By Kenneth W. Cooper, Flushing, N. Y.

The records composing this list are for the most part of Coleoptera not recorded from Long Island in the New York State List of Insects. It would seem that the Coleopterous fauna of Long Lsland has been little exploited, or else that local collectors have failed to show sufficient interest in their hobby to publish their records. Many of the species herein recorded are to be found in abundance throughout the state, yet have not been previously recorded from the Island. Nearly all of the species here listed were captured within the past year.

The records for *Carpophilus nitens* (Fall) and *Agrilus communis* ab. *rubicola* (Perrin) are not truly new additions for the State, but as they were not published in the New York State List of Insects I take the liberty to include them in this list. Mr. C. G. Siepmann first recorded *Carpophilus nitens* (Fall) from New York in the minutes of the Bulletin of the Brooklyn Entomological Society for June (1927), vol. xxii, p. 169; and Mr. W. S. Fisher noted *Agrilus communis* ab. *rubicola* (Perrin) from the state, under the name of *Agrilus viridis* var. *fagi* (Ratzeburg), in Bulletin 145 of the U. S. National Museum, p. 212. In a note at the bottom of page 209, *loc. cit.*, the true identity of the species is given.

With the exception of the determination of *Agrilus* by Mr. Fisher, of the U. S. National Museum, all of the species in this list were either determined or verified by Mr. Chas. Schaeffer, of the Brooklyn Museum.

The numbers preceding the generic names are those of the Leng Catalog. An asterisk (*) before the catalog number indicates that the species following was not recorded from New York State in the New York State List of Insects.

Carabidae

	248	*Notiophilus aquaticus* Linn.	L. I.—Flushing
*	249	*N. borealis* Harr.	L. I.—Flushing
	404	*Nomius pygmaeus* Dej.	L. I.—Flushing
	440	*Bembidion laevigatum* Say	L. I.—Flushing
	1174	*Omaseus caudicalis* Say	L. I.—Flushing
	1471	*Badister pulchellus* Lec.	L. I.—Flushing

		DYTISCIDAE	
*	2552	*Agabus aeruginosus* Aubé	L. I.—Flushing
		HYDROPHILIDAE	
	2750	*Helophorus lineatus* Say	L. I.—Flushing
		SILPHIDAE	
	2955	*Choleva terminans* Lec.	L. I.—Flushing
		SCYDMAENIDAE	
	3106	*Connophron clavicorne* Csy.	L. I.—Flushing
*	3111	*C. comptum* Csy.	L. I.—Flushing
	3194	*Cephennium corporosum* Lec.	L. I.—Flushing
		ORTHOPERIDAE	
	3236	*Gronevus truncatus Lec.*	L. I.—Southold
	6476a	*Orthoperus scutellaris* var. *piceus* Csy.	L. I.—Long Beach
	3252	*Sericoderus obscurus* Lec.	L. I.—Flushing
*	3279	*Arthrolips misellus* Lec.	L. I.—Flushing
		STAPHYLINIDAE	
	3322	*Proteinus atomarius* Er.	L. I.—Southold
*	3577	*Oxytelus nimius Csy.*	N. Y.—Darts
	3596	*Platystethus americanus* Er.	L. I.—Flushing
	3787	*Stenus stygicus* Say	L. I.—Flushing
	3832	*S. flavicornis* Er.	L. I.—Flushing
	3844	*S. callosus* Er.	L. I.—Flushing
	3872	*Euaesthetus americanus* Er.	L. I.—Flushing
	3908	*Gastrolobium bicolor* Grav.	L. I.—Flushing
	3928	*Hesperobium cinctum* Say	L. I.—Flushing
	3933	*H. cribratum* Lec.	L. I.—Flushing
	3966	*Lathrobium armatum* Say	L. I.—Flushing
	4093	*Aderocharis corticinus* Grav.	L. I.—Flushing
	4174	*Pseudomedon thoracicum* Csy.	L. I.—Flushing
	4216	*Scopaeus exiguus* Er.	L. I.—Flushing
	4257	*Stamnoderus monstrosus* Lec.	L. I.—Flushing
	4263	*Astenus linearis* Er.	L. I.—Flushing
	4265	*A. binotatus Say*	L. I.—Flushing
	4273	*A. discopunctatus* Say	L. I.—Flushing
*	4264	*A. spectrum* Csy.	L. I.—Flushing
	4443	*Philonthus lomatus* Er.	L. I.—Flushing

	4514	*Belonuchus formosus* Grav.	L. I.—Flushing
	4537	*Staphylinus tomentosus* Grav.	L. I.—Flatbush (Mr.Ballou)
	4578	*Quedius vernix* Lec.	L. I.—Flushing
	4686	*Tachyporus nitidulus* Fab.	L. I.—Flushing
*	4680	*T. pulchrus* Blatch.	L. I.—Roslyn (Mr.Ballou) Flushing
	4695	*Conosoma knoxi* Lec.	L. I.—Flushing
	4724	*Boletobius anticus* Horn	L. I.—Flushing Southold
*	4725	*B. pygmaeus* L.	N. Y.—Ithaca (Mr.Ballou)
	4737	*Bryoporus rufescens* Lec.	L. I.—Flushing
		Pselaphidae	
	6066	*Actium angustum* Csy.	L. I.—Southold
	6211	*Batrisodes denticollis* Csy.	L. I.—Flushing
	6213	*B. nigricans* Lec.	L. I.—Flushing
	6248	*Brachygluta cavicornis* Bndl.	L. I.—Flushing
*	6374	*Ceophyllus monilis* Lec.	L. I.—Flushing
		Ptiliidae	
	6468	*Smicrus filicornis* Fairm.	L. I.—Flushing
	6470	*Ptinella quercus* Lec.	L. I.—Flushing
		Scaphidiidae	
*	6494	*Scaphisoma impunctatum* Reit.	L. I.—Flushing
*	6521	*Baeocera picea* Csy.	L. I.—Flushing
		Histeridae	
	6602	*Hister incertus* Mars.	L. I.—Flushing
	6651	*Platysoma carolinum* Payk.	L. I.—Flushing
	6705	*Xestipyge geminatum* Lec.	L. I.—Whitestone
	6781	*Acritus politus* Lec.	L. I.—Flushing
	6901	*Saprinus dimidiatipennis* Lec.	L. I.—Southold Flushing
		Cleridae	
	7648	*Hydnocera lecontei* Wolc.	L. I.—Southold
		Mordellidae	
	7805	*Tomoxia lineella* Lec.	L. I.—Flushing
	7809	*Mordella borealis* Lec.	L. I.—Flushing

7872a	*Modellistena grammica* var. *varians* Lec.	L. I.—Southold
7879	*M. nigricans* Melsh.	L. I.—Southold
7888	*M. pustulata* Melsh.	L. I. Flushing
7889	*M. convicta* Lec.	L. I. Flushing
7893	*M. morula* Lec.	L. I.—Southold
7942	*Anaspis flavipennis* Hald.	L. I.—Southold

ANTHICIDAE

8325	*Mecynotarsus elegans* Lec.	L. I.—Long Beach

EUGLENIDAE

8484	*Zonantes fasciatus* Melsh.	L. I.—Southold

RHIPICERIDAE

8546	*Sandalus niger* Knoch.	L. I.—Flushing

ELATERIDAE

8601	*Monocrepidius vespertinus* Fab.	L. I.—Southold
8609	*M. bellus* Say	L. I.—Flushing
8663b	*Athous acanthus* var. *maculicollis* Lec.	L. I.—Southold
8893	*Agriotes pubescens* Melsh.	L. I.—Flushing
8939	*Elater sayi* Lec.	L. I.—Bayside
9040	*Melanotus parumpunctatus* Melsh.	L. I.—Southold

MELASIDAE

9125	*Melasis pectinicornis* Melsh.	L. I.—Flushing
9157	*Microrhagus triangularis* Say	L. I.—Southold

BUPRESTIDAE

*	*Agrilus communis* ab. *rubicola* Perrin	L. I.—Southold

HELODIDAE

9689	*Helodes thoracica* Guer.	L. I.—Flushing
9708	*Scirtes tibialis* Guer.	L. I.—Flushing
9709	*S. orbiculatus* Fab.	L. I.—Flushing

DERMESTIDAE

9785	*Trogoderma versicolor* Creutz.	L. I.—Flushing

NITIDULIDAE

....	*Brachypterolus pulicarius* L.	L. I.—Flushing
10016	*Cercometes abdominalis* Er.	L. I.—Flushing

10025	*Melegithes mutatus* Harold.	L. I.—Southold
10035	*Conotelus obscurus* Er.	L. I.—Southold
*10061	*Carpophilus nitens* Fall	L. I.—Flushing Southold
.....	*Nitidula carnaria* Schall.	L. I.—Flushing
	CUCUJIDAE	
10199	*Silvanus planatus* Germ.	L. I.—Flushing
10207	*Cathartus longulus* Blatch.	L. I.—Flushing Southold
*10219	*Pediacus fuscus* Er.	N. Y.—Darts
	EROTYLIDAE	
10287	*Languria trifasciata* Say	L. I.—Flushing
10328	*Triplax flavicollis* Lac.	L. I.—Flushing
	CRYPTOPHAGIDAE	
10361	*Loberus impressus* Lec.	L. I.—Flushing
10370	*Antherophagus ochraceus* Melsh.	L. I.—Southold
10427	*Caenoscelis macilenta* Csy.	L. I.—Long Beach
*10432	*C. obscura* Csy.	L. I.—Flushing
10467	*Anchicera distincta* Csy.	L. I.—Flushing
10471	*A. ochracea* Csy.	L. I.—Flushing
.....	*A. ebenina* Csy.	L. I.—Flushing
	MYCETOPHAGIDAE	
10491	*Mycetophagus flexuosus* Say	L. I.—Flushing
	COLYDIIDAE	
*10528	*Synchita obscura* Horn	L. I.—Southold
	LATHRIDIIDAE	
10631	*Lathridus liratus* Lec.	L. I.—Flushing Southold
10656	*Enicmus tenuicornis* L.	L. I.—Southold
10669	*Corticaria pubescens* Gyll.	L. I.—Southold
10685	*C. serrata* Payk.	L. I.—Southold
10696	*Melanophthalma picta* Lec.	L. I.—Flushing
10713	*M. cavicollis* Mann.	L. I.—Southold
	COCCINELLIDAE	
11035	*Scymnus puncticollis* Lec.	L. I.—Southold

Melandryidae

12548	*Microscapha clavicornis* Lec.	L. I.—Southold
12573	*Hypulus concolor* Lec.	L. I.—Southold
12578	*Symphora rugosa* Hald.	L. I.—Southold

Ptinidae

12600	*Gibbium psylliodes* Czemp.	L. I.—Flushing

Anobiidae

12852	*Caenocara scymnoides* Lec.	L. I.—Southold
12855	*C. oculata* Say	L. I.—Flushing

Sphindidae

12949	*Sphindus americanus* Lec.	L. I.—Long Beach
*12951	*S. trinifer* Csy.	L. I.—Flushing

Scarabeidae

13201	*Aphodius femoralis* Say	L. I.—Flushing
13220	*Ataenius imbricatus* Melsh.	L. I.—Long Beach
*.....	*Serica similis* Lewis	L. I.—Flushing
.....	*Autoserica castanea* Arrow	L. I.—Flushing
13445	*Diplotaxis harperi* Blanch.	L. I.—Flushing

Cerambycidae

14177	*Tylonotus bimaculatus* Hald.	L. I.—Flushing

Chrysomelidae

15217	*Donacia flavipes* Kby.	L. I.—Flushing
*15533	*Bassareus detritus* Oliv.	I. I.—Southold
15545	*Nodonota tristis* Oliv.	L. I.—Flushing
15699	*Phaedon viridis* Melsh.	L. I.—Flushing
*.....	*P. uniformis* Fall	L. I.—Flushing
*.....	*P. americanus* Schffr.	N. Y.—Darts
*.....	*Trirhabda borealis* Blake	N. Y.—Darts
16006	*Chaetocnema minuta* Melsh.	L. I.—Flushing
*16106	*Anoplitis rosea* Web.	L. I.—Flushing

Platystomidae

16304	*Brachytarsus sticticus* Boh.	L. I.—Southold
*16306	*B. paululus* Csy.	L. I.—Southold

CURCULIONIDAE

*16761	*Phytonomus maritimus* Titus	L. I.—Flushing
17151	*Magdalis armicollis* Say	L. I.—Flushing
17151a	*M. armicollis* var. *pallida* Say	L. I.—Flushing
17735	*Acanthoscelis curtus* Say	L. I.—Flushing
17762	*Ceutorhynchus rapae* Gyll.	L. I.—Flushing
17767	*C. marginatus* Payk.	L. I.—Flushing

A TOUCHING TALE OF THE QUAKING QUAG.

By C. A. Frost, Framingham, Mass.

While treading about the shores of a boggy pond at South Paris, Maine, on July 2, 1932, I disturbed many specimens of *Blethisa quadricollis.* The first ones I took were near the edge of the water on the soft mud amid the grass and weeds and these acted in a normal manner by running towards the drier ground, but as I worked out into the pond I found myself operating in 8 inches of water and about a foot of mud with aquatic grass and weeds; I saw two specimens of *Blethisa* swimming among the plant stems and when I attempted to pick one up it immediately disappeared beneath the water from which I was able to retrieve it, but the other one did not appear again during the half hour I remained watching for it to come up; and no treading or stirring of the mud was effective in bringing it to the surface. This is the second incident of a *Blethisa* disappearing for good under water while being pursued, but the first time it was noticed (at Wayland, Mass.) I was not sure that it was done deliberately.

The beetles seemed to have considerable difficulty in getting below the surface and I am not certain whether they were able to do so by diving or whether they really crawled down a grass stem. A number of specimens were taken several yards out in the pond on semi-floating mud islands into which one sank to the knees with every prospect of continuing down into the clinging ooze indefinitely.

I suppose it would be more soul-throbbingly pathetic to write a nature-faking epic on, "The Indomitable *Carabidae* I Have Met," and ascribe the action of the *Blethisa* to the last despairing act of an heroic insect which preferred death by drowning to capture by a "Bugologist."

OBSERVATIONS ON THE CHINESE MANTID PARATENODERA SINENSIS SAUSSURE

By Stanley W. Bromley, Assistant Entomologist, Bartlett Tree Research Laboratories, Stamford, Conn.

During the latter part of August and September of the past few years, the New York newspapers have had something out of the ordinary to feature in accounts of a "new bug" which had descended in numbers upon the city.

Last season (1931), the invasion had extended into southwestern Connecticut, and there are reasons for believing that the insect is actually now completing its life cycle within the confines of the State.

This refers to the Chinese mantid, *Paratenodera sinensis* Saussure, which is, of course, not a native species. The European mantis, *Mantis religiosa* Linn., introduced from the Old World and now well established in New York State about Rochester and Ithaca, where it was first reported in Entomological News, December 1899, by the late Professor M. V. Slingerland, and has recently appeared on Long Island, where it was discovered by Mr. Burns of the American Museum, has not as yet been taken in Connecticut, although egg masses were brought here in 1903, as stated in Mr. Walden's Orthoptera of Connecticut. These failed to hatch.

There are at least four other adventive species from the South which have been rarely taken in the North, where they were probably brought in on produce or on freight cars. The most frequent of these has been the common mantid of the South, *Stagnomantis carolina* Linn.

The Chinese mantid, however, is the species which has actually gained a foothold in the New York region and may become naturalized in parts of Connecticut.

Several attempts have been made to artificially establish it in the latter state. The first was in the winter of 1903, when Dr. Britton arranged for the importation of a number of egg masses from Philadelphia. A few of these hatched the following spring, but it is not thought that any reached maturity. The following winter a further attempt was made when about 25 more egg masses were obtained and distributed in five different localities.

"About a dozen adult specimens in all were seen in three of these localities the following fall, and in one of these localities a few adults were found the second season." However, the mantid was not observed in numbers again until this season.

The first establishment of the Chinese mantid in this country was near Philadelphia. Egg masses were accidentally brought in with nursery stock from Japan, and the first mantids were noted at Meehan's Nursery, Germantown, Pennsylvania, in about 1896. On February 1, 1902, an egg mass was sent in to the New Haven Experiment Station from a nursery in New Haven where it was found upon *Ilex crenata* which had been imported direct from Japan the previous spring. Another egg mass was found in the same nursery during the summer of 1903. In 1902 it was introduced into Staten Island by Mr. William T. Davis.

The Philadelphia colony was successful from the start as was also the Staten Island introduction. From Philadelphia the mantid extended its range more rapidly to the Northeast than in any other direction, although egg masses were planted in many parts of Pennsylvania. The species soon became common in New Jersey, where it may be now even classed as abundant in certain sections. It seems to prefer the drier areas, occurring most frequently on dry, bushy hillsides.

As it reached New York and Long Island, the mantid began to attract considerable attention. In 1928, inquiries were frequent at the American Museum of Natural History, most of the specimens coming from New Jersey, some from Long Island and some from New York City, where the specimens were taken on buildings.

In 1929, almost a hundred inquiries were received by the American Museum, and this figure was exceeded in 1930 and 1931, according to information received from Mr. Mutchler, who writes me under date of October 28th, "that during 1931 there were approximately 100 of such requests in New York City, Long Island and Westchester County, one coming from Mamaroneck." The greatest number in one day was on August 31, when seven letters and phone calls were received relative to this species. In 1930, specimens were found in an office located on the 40th floor of a building in the vicinity of 42nd Street and one or two specimens on the roof of the Equitable Building. During 1931 several were seen or taken on top of the Empire State Building.

On Staten Island, six specimens in one day have been received at the Museum, according to Mr. Leng. In 1929, an egg mass was found at Queens, L. I. by Mr. Engelhardt.

Its appearance on buildings in the large cities is amazing, but is probably due to the fact that as soon as the mantids mature and gain wings, there is a period of a couple of weeks or so when both sexes fly very readily and are no doubt carried by the wind considerable distances. The males fly during most of the period of their adult existence, but the females do not fly after they become heavy with eggs.

Being such a large and grotesque insect, it attracts attention wherever found. It was used by Herbert Johnson in a cartoon in the *Saturday Evening Post* of September 13, 1930, to represent the "Stock Market Bug."

It seems probable that it will become established in Westchester County and southwestern Connecticut. Its ultimate spread can only be conjectured. It is an insect which seems to be best favored by urban conditions. Probably its worst enemies are squirrels which, according to Mr. Davis, eat into the egg masses. Certain birds, as woodpeckers, or blue jays, do likewise. When its range overlaps that of the Carolina mantid, its eggs may become parasitized by the small chalcid which attacks those of the Carolina species. The much thicker protective coating of the egg masses of the Chinese species may, however, prevent this. At Stamford, a small jumping spider was noted feeding on the immature mantids.

The history of the Chinese mantid in Stamford, Conn., goes back to 1929 when two immature individuals were received at the Bartlett Tree Research Laboratories from Mr. William T. Davis of Staten Island. The first was received early in August, and was placed in a window between the glass and the screen. It fed readily on the following:

Black ants, *Formica subserica*
Deer flies, *Chrysops* sp.
Squash bug nymphs, *Anasa tristis*
Spotted cucumber beetles
Cabbage butterflies
Small frittilary butterfly
Bean moths, *Hypena scabra*

About the middle of August, another immature specimen was received which was larger than the preceding.

Between August 13 and August 20, this individual ate:

1 Bumble-bee worker, *Bombus vagans*
2 Cabbage butterflies
1 Viceroy
1 Carolina locust
1 Scudderia katydid

It rejected a *Vespa vidua* worker.

On August 22, it devoured a blow fly, *Calliphora erythrocephala,* and a black field cricket.

Both individuals died before attaining maturity.

On March 18, 1930, eleven egg masses were received from Mr. Davis. These were placed in glass fruit jars and kept in the Insectary until hatching as a protection from squirrels.

The eggs hatched over a period of ten days, beginning June 9th. As a rule, only one egg mass hatched the same day, but two hatched simultaneously on June 19th. One egg mass failed to hatch. Approximately 75 mantids hatched from each egg mass. These were liberated in many different places in the vicinity of the Laboratories. A few of the mantids were noted about the points of liberation for several days following; then they were seldom seen. On June 19th, a small jumping spider of the genus *Phiddipus* was seen feeding on one of the mantids of a fresh liberation, several hours after, and a careful examination revealed the fragments of two or three others which had evidently shared a similar fate.

During August, none were seen. On September 17th, a large mantid in the last instar was noted by Mr. Bartlett on a small chestnut tree within 20 feet of one of the points of liberation. On September 20th, this mantid which had not moved from the tree on which it was found, matured, developing wings, and was not seen the next day. The only other full-grown specimen was one which was seen by Robert Bartlett on the porch. This flew away. No others were seen or were egg masses found during the fall or winter.

During 1931, however, two adult females were noted in the vicinity of the Laboratories. One was discovered on September 22, within 50 feet of one of the points of the 1930 liberation and another on September 23 within 10 feet of a point of liberation. The latter was motionless on a small pin oak about 5 feet high, facing head downward on the main stem. It was not disturbed and on September 24th an egg mass was noted in the exact spot occupied by the mantid on the preceding day. A search disclosed the mantid about six feet from the tree, on the ground, where it was stalking a grasshopper (*M. femur-rubrum*) on a weed stem about 15 inches from the mantid's position. It moved slowly toward the grasshopper until within about three inches when it gave a sudden spring, capturing its prey on which it immediately began to feed. In seizing the grasshopper, it grasped also the weed stalk, securely bracing its prey against the stalk.

Both specimens were kept for a few days, the first being liberated before egg laying, and the second was kept for a week or more when it became weakened and was killed and kept for a specimen. They were fed mostly on grasshoppers which they seemed to prefer to other food. They ate many blue-bottle flies. Mexican bean beetle adults were eaten at first, but they soon tired of these and after a while would not touch them when other food was available.

An unverified report of one of these mantids attacking a field mouse in New Jersey prompted the experiment to determine if vertebrate prey would be taken. A small wood frog was introduced into the enclosure where one of the mantids was being kept. The mantid seized the frog but immediately rejected it without attempting to bite it, nor could it be induced to take the frog again. A large, active worker European hornet, *Vespa crabro,* was given to one of the mantids. A strenuous struggle was expected, but this was not realized, the mantid seizing the hornet with no more ado than it would a grasshopper and devoured it. The large hornet was completely helpless in the grasp of the powerful mantid. It was seized by the head and abdomen. The thorax was chewed into and hollowed out first.

Other mantids, however, were taken last year at Stamford, six miles away from the Laboratories, and also at Greenwich and South Norwalk. It is not thought that these were the progeny of the 1930 liberations at North Stamford, but rather individuals which had flown up from New York State, although it is possible that there have already been colonies established near the coast by preceding invasions.

A mantid was taken several years ago near Old Greenwich (formerly Sound Beach) and is now in the Bruce Museum at Greenwich. At least two were found in 1931 in early September on buildings or in the streets of Stamford, and others were found in Greenwich. On September 18th, a male was found by the writer in a field near Stamford. It was in flight when first noted and resembled the large bird-winged grasshopper (*Schistocerca americana*). As this would have been a remarkable record, I followed the specimen until it came to rest, when its identity was betrayed.

The economic status of this insect is probably not and will not be of importance. It is supposedly beneficial and probably prefers, in nature, other orthoptera, such as grasshoppers, but its sedentary habits precludes its feeding on a very great number of insects during its lifetime. I have come to believe that caged specimens fare much better as regards food than those in the field. It would not feed to any extent on beetles and experiments have indicated that it is not extremely fond of caterpillars. Mr. Davis states that those in his back yard were seen feeding on honey bees more frequently than other prey. If sufficiently starved, they will probably attack almost any insect that they could overpower, but their average food would no doubt consist of those insects which would be the most available, the most easily captured and overcome and which would appeal most to the mantid. Until further observations are made on the prey of the mantid under field conditions, this range of food could only be imperfectly surmised.

Another introduction of this species was made in Connecticut by Dr. Frank Lutz of the American Museum, and Professor F. M. Brown at Avon Old Farms, Avon, near Hartford, where egg masses were placed in the spring of 1929 and where later an adult mantid was noted by Mr. Brown.

During 1931, also, several adult specimens were collected in Columbus, Ohio, where the egg masses were probably accidentally brought in on nursery stock.

Editorial Note—Some hundred or more egg-masses were found at Hastings-on-Hudson by Mr. Wm. Vogt. Fifty or so were put in the shrubbery at my house in White Plains, N. Y., where one large female was found about September 15. Another specimen was taken in White Plains in August.

NOTES ON COLLECTING CERTAIN HISTERIDAE

Carl George Siepmann, Rahway, N. J.

Hololepta lucida. The beetles of this genus are almost invariably found beneath bark, their very depressed form adapting them for an existence in such places. I was never very successful in obtaining specimens, two of them taken beneath bark on the same day at Rahway, N. J. representing, with the following exception, the only ones obtained. However, during the late summer and early autumn of 1930, a series of about 50 specimens was taken at Avenel, N. Y. on fruit baits. Although various kinds of fruit were used, this species occurred only on smashed peaches, which had become old and black, in which case the beetles were inside the peaches, close to the pit, and between muskmelon rinds when the two halves were set together as in the original melon. Other fruit baits, as bananas, crushed apples, and grapes, did not yield any of these beetles. During 1931, although a large number of fruit baits were set and examined daily during the entire summer, only one *Hololepta* was obtained. All of the specimens taken so far were *lucida; aequalis* is said to be equally common in northern New Jersey, but no specimens were noted.

Hister immunis. A large series of this species was collected by Mr. Everett Lerch and myself beneath stones along the mountain road ascending Musconetcong Mountain from Glen Gardner, N. J., on May 18, 1930. Returning again on May 10, 1931, a similar series was obtained. The species was found over the entire stretch of road, but none were found beneath the stones on the summit of the mountain, or elsewhere away from the road. This record is of interest, partly because beetles of the genus *Hister* are rarely found beneath stones, even singly, and partly because it is the only locality where I have found this species. No explanation for the occurrence of this species can be offered; nor any other species of *Histeridae* taken with them. The males of *immunis* are decidedly smaller and narrower than the females; this difference is not evident in the other species of *Hister* I have so far examined.

A NEW BEE OF THE GENUS HOPLITIS.

By T. D. A. Cockerell, Boulder, Colo.

Although bees have been collected at Boulder, Colorado, for over a quarter of a century, new species may still be found. This spring, on May 22, Mr. Charles Hicks bred a female *Hoplitis* from the rest, and it proves to be undescribed.

Hoplitis hicksi n. sp.

♀. Length about 9 mm., anterior wing 6.5; black, moderately shining, the head and thorax with greyish-white hair, long and rather dense and clearer (but by no means pure) white on face, and orange hair beneath edge of clypeus; antennae entirely black; facial quadrangle broad, not far from square; mandibles broad, densely punctate, quadridentate, but the two inner teeth low and small; clypeus dull and closely punctured, the lower edge straight, neither clypeus nor supraclypeal area showing any shining spaces; front densely punctured; cheeks very broad; mesothorax and scutellum shining, with distinct but well separated punctures; notauli linear, not very long; basal area of metathorax dull; tegulae black; wings greyish, with a paler transverse band just beyond the cells; stigma and nervures black; basal nervure meeting nervulus; second cubital cell receiving recurrent nervures equally distant from base and apex, this distance about or hardly equal to half length of first intercubitus; legs black, with pale hair, light reddish fulvous on inner side of hind tarsi; abdomen shining, rather weakly punctured, hair-bands dull white, on first tergite only at sides, on second rather broadly interrupted in middle, on third narrowly interrupted; sixth tergite with short pruinose pubescence; ventral scopa very pale fulvous. Boulder, Colorado (Hicks, 2932).

From *H. mesae* Ckll. and *H. graceae* Ckll. it is easily known by the entirely black antennae and quadridentate mandibles. The following table separates it from a series of black Osmiines, with which it could be confused.

Key

Ventral scopa all black; abdomen without bands
Osmia globosa Cresson

Ventral scopa not at all, or not all, black; abdomen with white hair-bands, at least at sides 1

1. A conspicuous polished spot or band on upper end of clypeus; ventral scopa white 2
   No such shining mark on upper end of clypeus 3
2. Area of metathorax shining; more robust species, with more strongly and closely punctured mesothorax *Hoplitis sambuci* Titus
   Area of metathorax dull; eyes light greenish *H. mescalerium* Ckll.
3. Area of metathorax shining 4
   Area of metathorax dull, slightly shining seen from behind..5
4. Eyes dark green; fifth tergite without light hairs; clypeus with black hair ....*Osmia abjecta* Cresson
   Eyes black; fifth tergite with light hairs; clypeus with short reddish hair ....*Osmia* n. sp Sandhouse MS.
5. Larger; wings strongly reddened; hind femora stouter *Andronicus cylindricus* Cresson (*monardae* Ckll.)
   Smaller; wings not at all reddened .....*Hoplitis hicksi* Ckll.

In 1929, Miss Sandhouse pointed out to me that in true *Osmia* the notauli are greatly reduced and often punctiform, whereas in *Monumetha, Alcidamea,* etc., there is a distinct slender line. I find that in *Hoplitis adunca* (Panzer), the type of *Hoplitis,* the notauli are linear. They are of the linear type in our *H. mesae, hicksi, sambuci* (but short and weak), *Osmia abjecta, Andronicus cylindricus,* and also in *Osmia* n. sp Sandh. MS. But in *H. mescalerium* they are obsolete, and in *Osmia globosa* they are punctiform. *Osmia rufa* (L.), the type of *Osmia,* has them short and subpunctiform.

There is a closely related genus, *Hoplitina,* found in California and Arizona. The type is *H. pentamera* Ckll., and *H. hesperia* Crawford, described six years later, is considered (litt., 1928) by Mr. Timberlake to be its female. American workers have recognized a number of genera segregated from *Osmia,* which in Europe are considered only subgenera.

LOST IN THE FOREST OF ORIGINAL DESCRIPTIONS

By J. D. Gunder, Pasadena, Calif.

[Perhaps you saw the June issue of the Bulletin. Well, our friend Dr. E. N. Tom Ology (we call him Dr. Tom for short) recovered from the attack of ptomaine he had at the Zoological party, but he says, "From now on, I'm off those 'bones' from that Zoological binary nomenclature 'stew'! Those old Zoological boys can get away with it, but I can't. If I have to run with that crowd for the rest of my life, I think I might as well pack up my insect cases and move back into the fundamental hills of Tennessee." Poor old Dr. Tom, he's between the jellyfish and the elephants in the Zoological combine which is the same as being between the devil and the deep blue sea when it comes to individuality of endeavor.]

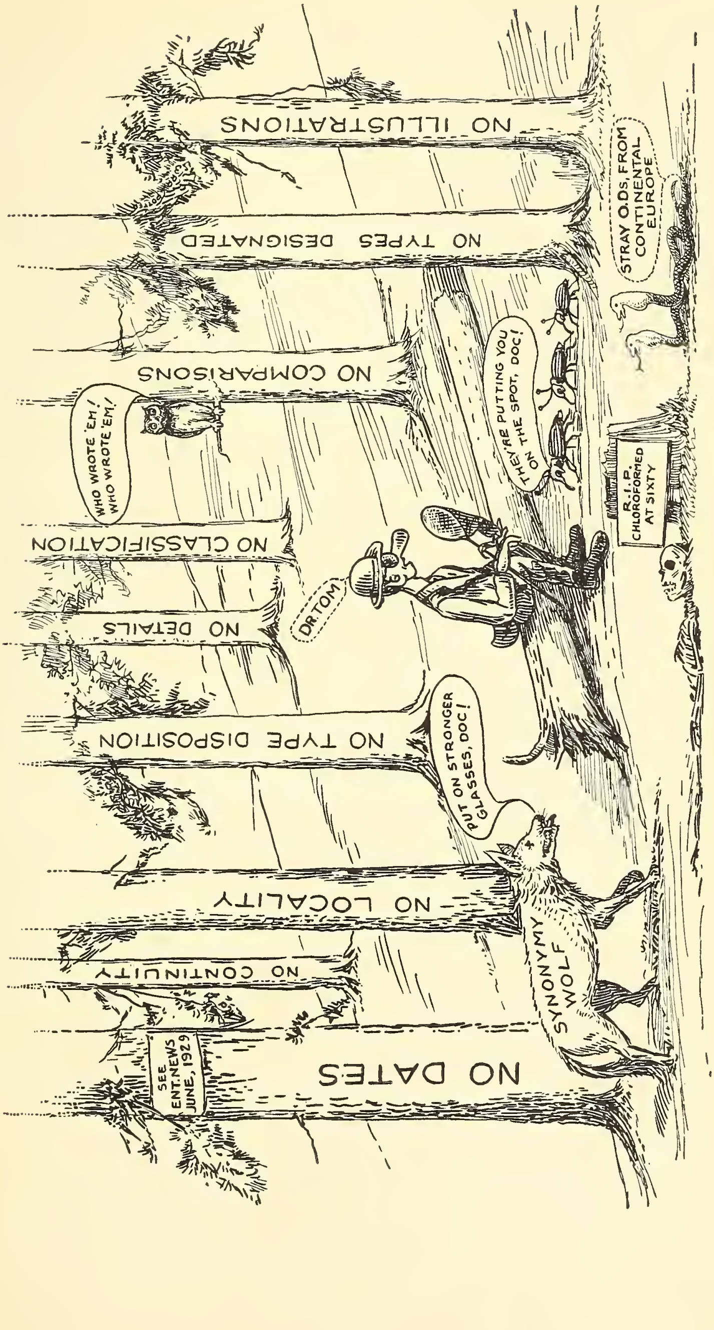
I want you to carefully study the accompanying illustration in this issue. It shows Dr. Tom "lost in the forest of bad original descriptions" and who amongst us has not, at one time or another, been lost in a similar forest? Fancy wishing to know a definite type locality for some insect and find it published only as "Calif." or "Rocky Mts." or "Brazil"! Also fancy the need of knowing the exact time of year to send out a special field collector for a much desired insect and find the original description only records —"1927," or nothing at all! And again fancy plowing through useless pages of technical characterization only to find no comparative description included. It's enough to make any one cuss. However, original descriptions are improving and authors are realizing that mere description isn't all, but that accompanying statistics are JUST AS VITAL, for the use of the average student.

For some time Dr. Tom had been of the opinion that "nom. nud." names were a thing of the past; that modern entomological authors were up-to-date enough not to burden literature with such offerings. A "nom. nud." is a new name mentioned without description, illustration or at least an indication of what the name represents. Imagine his surprise therefore, at recently finding the following by Dr. Austin H. Clark of the U. S. National Museum in the Annals of the Association of American Geographers, Vol. XVII, No. 1, page 126, March, 1927; *i.e.* ". . . *while this species possesses a curious variant* (*D. a. hughi*) *only known from a single bog in Essex, Mass.*" That is the original description of

Dryas aphrodite hughi Clark! Can any one tell what *hughi* looks like? Can any one tell what kind of a "curious variant" is meant? Was the mention of that new name in text of any entomological reference value? Dr. Tom doesn't think so.

Just why some authors, when describing a new insect, do not add a few more lines of information to their data is ofttimes an enigma to Dr. Tom. When helpful data are known and easily available, as it was in the following cited instance, it should have been included; to wit., the recent original description of *Loxolomia johnsoni* by Dr. William Schaus of the U. S. National Museum, Washington, D. C., in the Entomological News for June, 1932, page 156, in which he cites the following: *"Habitat: Peru. Type in collection of Mr. Frank Johnson."* From the standpoint of Dr. Tom, this is meager data. Dr. Schaus' data should have been developed farther, to read more correctly and fully as follows: *Holotype, male; Chanchamayo District, Peru, altitude 3,000–5,000 feet; November or December, 1931; taken by a native collector and received by Mr. Johnson through a naturalist in Lima, Peru. Type in collection of Mr. Frank Johnson of New York, N. Y. after whom it is named.* An analysis of the suggested change may be summarized as follows: *1st.* Regarding the word "Habitat." The habitat of an insect group cannot be definitely established in a primary instance, especially on a single male, but a type locality can be; therefore, type locality is a better phrase to use in this instance. Working entomologists are interested in type localities in original descriptions and not in asserted habitats. *2nd.* The simple citation of "Peru"[1] is insufficient data, even as, for example, "Lower Calif." would be for American or Mexican entomologists. *3rd.* Dates of capture are necessary in every description. Few, if any, Lepidopterists dispute this point. Dr. Schaus continues to describe hundreds of South American Lepidoptera without giving dates. Territorial "wet season" or "dry season," as an excuse, unfortunately does not always hold good everywhere because altitude has to be taken into consideration. *4th.* By adding Mr. Johnson's present address, future South American entomologists will know that his collection was in New York and not in Minnesota or in Norway or Sweden. Their knowledge of our collectors and collections is just as poor as ours would be of theirs. Dr. Thom believes in "giving them a break," too.

[1] Peru has an area of nearly 700,000 square miles; and several very distinct climatic regions.—Editor.



Lost in the Forest of Bad Original Descriptions—Gunder.
(Text on opposite page.)

BOOK NOTES

Medical Entomology—A Survey of Insects and Allied Forms which Affect the Health of Man and Animals, by William A. Riley and Oskar A. Johannsen [Pp. i–xii+1–476, 1 plate (frontispiece) and figs. 1–184. McGraw-Hill Book Co., New York. $4.50.]

In this work, Dr. Riley and Dr. Johannsen bring to date their useful "Handbook of Medical Entomology" published some 15 years ago by the Comstock Publishing Co. The text of the older work has been entirely revised. The authors consider in this work not only the present status of our knowledge of insects as carriers of disease, but also the pioneer work on which our progress is founded. In certain ways, their approach to the subject is historical, thus valuable from the standpoint of pure entomology. The first chapter deals with the early suggestions of insects as the agency in carrying diseases; and the next chapter tells of the ways in which arthropods may affect the health of man and animals. The following 22 chapters take up in systematic order the classes of the Phylum Arthropoda that are of medical importance, beginning with the Crustacea and on through the Hymenoptera. Of the Orders of the Insecta, as is natural and to be expected, only those Heteroptera whose activities have been studied because of their obvious and proved condition as carriers of disease are most fully treated of. The one lack in this treatment, to the writer, is the absence of direct reference to the Lygaeidae as possible or potential vectors. It is well known that the genera *Lygaeus* and *Oncopeltus,* which feed on the milky sap of Euphorbiaceae, take in with it certain infursorians, which may or may not be active agents in human disease; but no mention is made of this. Again, it is well established that the anthocorid *Anthocoris borealis* is quite a pest in the hop fields of New York at hop-picking time—an overlooked reference. In general, many of the smaller bugs make exploratory incisions in human beings when they alight on perspiration-moist skin. These are mostly in the families Lygaeidae, Miridae and Anthocoridae. It might be said that all Heteroptera, plant as well as animal feeders, should be regarded with suspicion, either as potential parasites or as possible carriers of disease-producing organisms.

Doubtless, another reviewer familiar with the minutiae of some of the other families might also point out refinements derived from the perusal of obscure monographs. This, of course, is really painting the lily, for, after all, no one man is able to know *all* about every group of insects; nor can he be expected to read every work that is written on each and every insect in order to extract here and there a grain of wheat out of a very alp of chaff.

A suggestion to publishers is that they should not rely on the regular proof-readers to check up on the spelling of entomological names. Between pages 145 and 163 (which we read carefully), we found four misspellings or typographical errors in the names of Heteroptera.

The authors are to be congratulated on the fine entomological presentation of their subject; without pretentiousness, they have set before us an excellent conspectus of a subject of the greatest importance, now that civilized man is turning more and more to the tropics as a suitable home for humanity.

J. R. T.-B.

Iconographia Insectorum Japonicorum—(Nippon Konchu Zukan), (Hokuryukan, Tokyo, 1932. Price 15 Yen.)

The appearance of this really notable work will fill a great gap in the field of Entomology. The only other comprehensive works on the Japanese fauna are the relatively expensive Matsumura "Thousand Insects of Japan," in 12 volumes, and the more recently published "6000 Illustrated Insects of Japan-Empire."

The present work is a handsomely bound volume of more than 2400 pages, presenting careful black-and-white figures of more than 4000 species of Japanese and Formosan insects. The plan of the present work is to figure two species of insects at the head of each page, giving a detailed discussion of the insect immediately beneath the figure. All text discussions are in Japanese but the figures are so remarkably well-executed that the work is perfectly usable by all workers.

The scientific accuracy of the monograph is assured by the collaboration of 26 of the leading specialists in the Empire. The first 220 pages are occupied by detailed scientific and Japanese indices to the species treated. The content of the work may best be shown by the comparative figures of species treated in each order: Apterygota, 28; Orthoptera, 156; Dermaptera, 20; Plecoptera, 26; Isoptera, 12; Embiidina, 2; Corrodentia, 20; Mallophaga-Anoplura, 54; Ephemerida, 24; Odonata, 104; Thysanoptera, 16; Homoptera, 368; Heteroptera, 284; Neuroptera, 62; Mecoptera, 16; Trichoptera, 28; Lepidoptera, Heterocera, 918; Rhopalocera, 398; Coleoptera, 700; Strepsiptera, 3; Hymenoptera, 450; Diptera, 474; Siphonaptera, 10.

Added features are found in the figures comparing 218 species of larvae and nymphs, and in the 24 beautifully executed colored plates that conclude the volume. One of these, showing a comparison of the insect life of ponds contrasted with the comparable life of mountain streams, is especially noteworthy.

The monograph will be of unusual value to almost all classes of entomologists. To those desiring a picture of the fauna of Eastern Asia; to the applied entomologist who needs information concerning actual or potential insect enemies in their original home; or to the special student, interested in some particular family or order of insects.

It is almost inconceivable that one could secure a work of this calibre, having more than double the number of pages and illustrations to be found in Blatchley's "Coleoptera," at a price of approximately five dollars. Due to the present favorable balance of exchange this is an accomplished fact. Professor Teiso Esaki, Entomological Laboratory, College of Agriculture, Kiushiu Imperial University, Fukuoka, Japan, will act as intermediary and will accept orders at the price of 15 Yen.

C. P. Alexander, Amherst, Mass.

PROCEEDINGS OF THE SOCIETY

Meeting of March 10, 1932.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, March 10, 1932, at 10.15 p. m. President Davis in the chair and ten other members present, *viz.*, Messrs. Ballou, Engelhardt, L. Lacey, Lemmer, Lerch, Moennich, Nicolay, Schaeffer, Siepmann, and Wilford; and Mr. Stecher.

The minutes of the previous meeting were read and approved, and the treasurer presented his monthly report.

Mr. Schaeffer proposed for membership Dr. Henry Kienzle, 1045 Forest Avenue, Ridgewood, Long Island, New York, the proposal being held over for action at the next meeting in regular course.

A folder describing the itinerary available for entomologists who will attend the Fifth International Congress of Entomology in Paris was exhibited by Mr. Engelhardt.

Mr. Davis commented upon a new bulletin published by the Smithsonian Institution, on "The Butterflies of the District of Columbia and Vicinity," by Austin H. Clark, saying that he considered it a very useful book. A bound copy of the "Synopsis of Principal Larval Forms of Coleoptera" was exhibited by Mr. Schaeffer.

Mrs. Siepmann red Mr. Torre-Bueno's paper on the "Heteroptera Collected in Florida by Carl George Siepmann," exhibiting specimens. The study was of interest because it showed the relative proportion of species at a fixed time in a restricted area; thirty-seven species in all were obtained. Mr. Torre-Bueno's paper will be published separately in the Bulletin.

Mr. Lerch exhibited a box of Homoptera, collected by J. F. Brimley in Ontario, including, among other species, *Heliria praealta* Fowl. variety *rubidella* Ball, *Palonica tremulata* Ball, *Telamona tiliae* Ball, and *Telamona spreta* Goding. Mr. Lerch also exhibited some excellent enlarged photographs he had taken of Homoptera in his collection.

Mr. Lacey reported that he had taken the Coccinellid beetle, *Adalia frigida* variety *humeralis*, and *Dendrophilus punctulatus* under bark in Westchester County, New York.

Mr. Davis exhibited specimens of *Coccinella undecimpunctata*, collected by Roy Latham, at Orient, L. I. This is a new record for the Island, the previously recorded distribution for this species being Massachusetts, Alaska, and the seacoast of Europe. Mr. Davis also exhibited a box of exotic cicadas.

Mr. Engelhardt spoke of some of the Coleoptera he had collected on his trip to the southwest, illustrating his talk with specimens. *Cicindela obsoleta,* and the variety *prasina,* and *Cicindela horni* were obtained in the Davis Mountains, Texas. The first named species was extremely shy and difficult to capture, usually flying about two hundred feet before alighting. A series of *Calligrapha serpentina* were collected on the summit of Mitre Peak. Mr. Engelhardt explained that the specimens were of a bright silvery color when collected, but that after death the coloration faded. *Enoclerus spinolae* was taken on Agava in the Chisos Mountains. At Mobile, Alabama, *Psammodes hydropicus, Pseudephalus brevicornis,* and *Ulus maritimus* were obtained by digging in the soil. Mr. Engelhardt exhibited a living larva of *Phengodes laticollis,* also from Mobile, which he had reared by feeding it upon millipedes. Two Carabidae, *Sphaeroderus nitidicollis* var. *brevoorti* and *Trechus micans* from Smuggler's Notch, Mt. Mansfield, Vermont, completed the exhibit.

The meeting adjourned at 10.15 p. m.

Carl Geo. Siepmann,
Secretary.

Meeting of April 14, 1932.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, April 14, 1932 at 8.15 p. m.

President Davis in the chair and fourteen other members present, viz., Messrs. Angell, Ballou, Bell, Cleff, Engelhardt, Lacey, Lemmer, Lerch, Moennich, Nicolay, Schaeffer, Siepmann, Torre-Bueno, and Wilford, and Messrs. Pollard and Stecher.

The minutes of the previous meeting were read and approved. Mr. Torre-Bueno, reporting for the publication committee, reported that the February Bulletin was out and that there was a slight delay in getting out the April number.

Mr. Engelhardt exhibited a few letters he had received from prominent entomologists in various parts of the world commenting upon the Böving and Craighead paper, and a copy of a review of the same paper that was published in an European entomological journal.

Mr. Moennich, reporting for the outing committee, stated that a field trip was planned for Sunday, May 1, to Richmond, Staten Island, to be led by Mr. Davis.

The society next considered the election of Dr. Henry Kienzle, who was proposed for membership at the March meeting. On motion the secretary cast one ballot for his election, which was accordingly done.

Mr. Davis exhibited some Coleoptera collected by Roy Latham on Long Island, including a few species new to or rare on the Island. Three of the more interesting species were *Cerambycidae: Leptura emarginata* Fab. was taken at Mattituck, L. I., on September 1, 1926, and July 1, 1926. This species, although recorded from New York in the State List, was not recorded from Long Island. *Ophistomis acuminata* Oliv. was taken at Mattituck, L. I. on August 10, 1925. In the New York State List, there is only one Long Island record, Yaphank, for this species. *Atimia confusa* Say was taken at Orient, L. I., on May 10, 1920, and July 7, 1928, and is not recorded from Long Island in the State List. Two species of southern distribution not hitherto recorded from New York State were also obtained. They are *Chalcophora georgiana* Lec. (*Buprestidae*) taken at Southold, L. I., October 2, 1926, and *Agrypnus sallei* (*Elateridae*) taken at East Marion, L. I., July 6, 1917.

Mr. Davis stated that while *Buprestis georgiana* and *Agrypnus sallei* were southern species now reported for the first time from New York State, he had likewise collected some southern species on Long Island. He cited *Tetracha virginica* taken at Central Park, Sept. 8, 1911, and the cricket *Cycloptilum squamosum* taken at East Marion, not far from Orient, August 2, 1913. He also stated that Mr. Latham had collected the southern butterfly *Thecla cecrops* at East Marion, Aug. 14, 1912, as recorded in the BULLETIN, February, 1929, p. 48.

Mr. Schaeffer said that *Leptura emarginata* had been taken by Mr. Weeks and his capture was reported in a list of additions to the State List.

Mr. Davis exhibited some *Cecropia* cocoons collected by Miss Lund. Four of the cocoons were opened up by mice, and the pupae removed. In the other two, the mice had made a small puncture, and then left. Investigation showed that the reason for this was that the pupae inside the cocoons had become moldy, and in that condition were not palatable to the mice.

A number of new records of Lepidoptera were presented by Mr. Mr. Lemmer, who exhibited specimens of some of the species. The list will be published separately in the BULLETIN. A discussion followed as to the relative merits of just mentioning new records in the minutes of the society as compared with publishing a separate article on the subject. Mr. Torre-Bueno brought out that while it was sufficient if such records were published in the minutes, which, in the BULLETIN would be included in the index at the end of each volume, the Long Island Records distinguished in the usual manner, so that they could be picked out by just glancing through the index, it would be more satisfactory to publish such records as a separate article whereby they would be more likely to attract attention.

Mr. Nicolay presented an interesting talk on his trip to St. Simon's Island, Georgia, in company with Mr. Frost and Mr. Quirsfeld during the past summer, illustrating his discussion with photographs and specimens. St. Simon's Island is off the southeast coast of Georgia, not very far above Florida. Pine groves, traversed by white trails, occur on part of the island; the southern part is flat and grassy. As might be expected on an island, on account of the lack of many kinds of trees and the general limation of the flora, there was not as much variety in the insect life as might be desired. In the *Cicindelidae, Cicindela dorsalis* vr. *media* and a variety of *Cicindela marginata* were collected. *Cicindela trifasciata* vr. *tortuosa* was obtained about a pond further inland. At this point, Mr. Nicolay mentioned that it was possible to restore the markings of discolored *Cicindelidae* by putting them in chloroform for a couple of days and nights. In the *Carabidae,* very few specimens were obtained beneath stones and other cover. *Callida* and *Lebia* were obtained by beating grape vines into an umbrella. Most of the *Carabidae* were obtained in the vicinity of artesian wells, by following the ditches that carried off the excess water. *Ega sallei,* a small ant-like species was found about ditches, as well as the more active *Euphorticus pubescens. Tetragonoderus intersectus* was also taken. *Ardistomis viridis* and *obliquata* were obtained in the vicinity of the pond. The most interesting Carabid obtained was *Eucaerus varicornis,* considered a rare species, which was found in half submerged logs. The outer joints of the antennae of this species are white.

The meeting adjourned at 10:30 p. m.

CARL GEO. SIEPMANN, *Secretary.*

Vol. XXVII DECEMBER, 1932 No. 5

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

BROOKLYN ENTOMOLOGICAL SOCIETY
1872

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, Editor

CARL GEO. SIEPMAN GEO. P. ENGELHARDT

Published for the Society by the
Science Press Printing Co.,
Lime and Green Sts., Lancaster, Pa.,

Price, 60 cents Subscription, $2.50 per year

Mailed November 29, 1932

Entered as second-class matter January 21, 1919, at the post office at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

CONTENTS

Bulletin of the Brooklyn Entomological Society

Published in
February, April, June, October and December of each year

Subscription price, domestic, $2.50 per year; foreign, $2.75 in advance; single copies, 60 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE–BUENO, Editor,
38 De Kalb Avenue, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXVII December, 1932 No. 5

NOTES ON WEST INDIAN ANTS.

By C. G. Aguayo, Habana, Cuba.

The material for this paper has been obtained from several sources. The Cuban species were collected by Pedro J. Bermúdez, of the University of Havana; by S. C. Bruner, of the Agricultural Experimental Station of Santiago de las Vegas, Cuba; by Miguel Jaume, of Havana; by Allan Archer, of Boston; and by the writer. The ants from Jamaica were found alive within some shells sent to the Museum of Comparative Zoölogy of Harvard College by B. W. Arnold, who collected them during a trip to that island in March and April of the present year. The species recorded from the Bahamas and Haiti were in the miscellaneous collections of the Museum of Comparative Zoölogy.

In addition to those forms believed new, there are also described the hitherto unknown females of *Prenolepis gibberosa* var. *rogeri* and *Macromischa lugens.* Several other species are listed as data for their geographic distribution.

I wish to acknowledge my appreciation to Dr. Nathan Banks for giving me the free use of the ant collection of the Museum of Comparative Zoölogy; and to Dr. W. M. Wheeler for allowing me the use of his invaluable collection as well as for helping me in the identification of some species, without which the completion of this paper would have been greatly handicapped.

Euponera (*Trachymesopus*) *succedanea* (Roger).

One specimen, taken by Dr. P. J. Bermúdez at El Guabinacho, Pinar del Río, Cuba, agrees very well with Roger's description. This species can be easily separated from *E. stigma* (Fabr.) by the differences pointed out by Forel (1913, Bull. Soc. Vaud. Sci. Nat., 49, p. 204), being smaller, and having the sides of the head much less convex.

Anochetus mayri laevior Wheeler.

A single worker of this subspecies was taken by P. J. Bermúdez at El Purio, Santa Clara, Cuba, July 1930. The typical form of the species is very widely distributed through the Antillean region, but this variety was known only from Jamaica.

Odontomachus haematoda (Lin.)

One specimen referable to the typical dark form of the species was collected at Rum Key No. 6, Bahamas, during the trip of the Yacht Utowana. It was known to occur in several of the Antilles, but was not recorded before from the Bahama Islands and has not been found in Cuba.

Odontomachus haematoda insularis (Guér.) var. *pallens* Wheeler.

Two workers from Diquini, Haiti, collected by W. M. Mann, are in the collection of the Museum of Comparative Zoölogy. This variety has not previously been reported from this island.

Odontomachus haematoda insularis (Guér.) var. *wheeleri* Mann.

Two workers which seem to belong to this variety were taken by A. Archer at San Vicente, Vinales, Cuba, July 1930. Differ from *insularis* by having the epinotum less high, with the basal portion passing into the epinotal declivity by a more even curve; the petiole is longer, with a much longer spine; the sculpture of the head is finer, with the sides smoother and more shining; the mesopleura very shining, with a few and feeble striae near the prothoracic suture; the head, antennae, mandibles and thorax reddish brown; gaster black; epinotum, petiole and legs yellowish brown; tarsi and articulations of legs darker.

Differ from var. *pallens* by their smaller size, different coloration and finer sculpture. The head is narrower as well as the petiole.

Ponera opaciceps Mayr var. **jamaicensis**, var. nov.

Worker.—Length 6.8 mm.

Head 1.8 times longer than broad. Sides convex, occipital corners rounded. Frontal impression feeble, ending at the middle of the sides of the head. Eyes distant almost twice their diameter from the articulations of the mandibles. Antennal scapes scarcely surpassing the occipital corners.

Thorax as in the typical form. Petiolar node slightly cuneiform, in profile about 1 1/5 times higher than long; seen from above about 1.5 times broader than long; anterior surface convex, posterior concave.

Whole body very shining. Punctures as in *opaciceps*. Erect hairs very scarce, pubescence short and less abundant than in the typical form.

Body and antennal scapes black. Coxae, femora and funiculus dark brown; rest of the legs and the mandibles reddish brown. Last segment of the gaster and sting yellow.

Described from one specimen found in shells collected at Mile Gully, Green Mountains, Jamaica, April 1932. B. W. Arnold collector.

Differs from the typical *opaciceps* by having larger head, shorter antennal scapes, narrower petiolar node, which is distinctly narrower above, darker coloration, shorter pilosity and shinier surface; from var. *cubana* Santschi, by its longer head, darker coloration and the shape of petiolar node. As those differences are not very marked and have been described from only one specimen it seems better to consider it only as a variety of the widely distributed *opaciceps*.

Holotype in the Museum of Comparative Zoölogy.

Pseudomyrma flavidula F. Smith var. **jaumei**, var. nov.

Worker.—Length 4 mm.

This form is very near var. *pazosi* Santschi, differing from it as well as from the typical *flavidula* by the proportions of the head, the position of the eyes and the coloration.

Head subrectangular, shorter and with sides more parallel than in *flavidula*. Eyes distant from the occipital corners by half their length.

The post-petiole is less globose than in *flavidula*, the sculpture of epinotum coarser and the head is more shining, but as these characters are variable in *flavidula* and *pazosi*, more material will be necessary to examine before defining them.

Gaster very shining and black as in *pazosi;* rest of the body and appendages uniformly dark brown. Legs with infuscate longitudinal stripes. Tegument of body and appendages translucent.

The coloration is somewhat similar to that of *P. brunnea*, from which it is easily distinguishable by the form of the post-petiole.

Described from one specimen taken at El Palenque, Matanzas, Cuba, March 1931, by Miguel Jaume, to whom I take pleasure in dedicating it.

Holotype in the Museum of Comparative Zoölogy.

Monomorium destructor (Jerd.)

This tropicopolitan species seems to be very widely distributed in Cuba, in spite of its having been reported only once (Wheeler and Mann, 1914, Bull. Amer. Mus. Nat. Hist., 33, p. 5, footnote). I have seen series of workers from Habana (N. Banks); Caibarien (P. J. Bermúdez, Aug. 1930), and Holguín (C. G. Aguayo, Aug. 1930).

Solenopsis picea Emery.

Four workers from Ocho Rios, Jamaica, collected by B. W. Arnold, March 1932, seem to belong to this small, black, shining species. Not recorded before from the Island.

Tetramorium lucayanum Wheeler, var.

Differs from the typical *lucayanum,* known from Bahamas and Cuba, by having the antennal scapes and the coxae black instead of reddish brown; the femora are black instead of dark brown. In this respect it could perhaps be considered as representing a distinct variety.

Two large series of workers from Ocho Ríos, Jamaica and Mile Gully, Green Mountains, Jamaica, collected by B. W. Arnold, March 1932, show constantly the above mentioned characters.

Pheidole longiceps, sp. nov.

Soldier.—Length 3.1 mm.

Head large, rectangular, about 1.6 times longer than broad, with the sides parallel, posterior corners rounded, separated by a deep and wide occipital notch, which is continued forward as a shallow groove. Mandibles large, convex, masticatory border arcuate, terminating in an acute apical and a subapical tooth. Clypeus convex, without carina, anterior border slightly concave. Frontal area elongate and triangular. Frontal carinae strong, flattened, continued backward on each side as an oblique ridge, which borders a long and wide groove for the antennal scapes. The grooves end at the middle of the sides of the head, then pass backward and downward as smooth zones. Antennae short, scapes curved at their base and enlarged at their apical portion, reaching to a short distance behind the eyes. Eyes convex, situated at the anterior fourth of the sides of the head.

Pronotum globose, with a pair of blunt and not very conspicuous tubercles at the middle of the sides, and a pair of short, blunt tubercles before the pro-mesonotal suture. Mesonotum short and convex. Epinotum longitudinally impressed, the basal portion evenly passing into the declivity. Epinotal spines short, triangularly shaped, directed upward, backward and slightly outward.

Peduncle of petiole short and depressed, strongly constricted at the anterior third, broader at the middle, forming an angle at each side. Node seen from above, oval, slightly broader than petiole and about 2½ times broader than long, longitudinally incised on the upper surface; in profile, 2½ times as high as long. Post-petiole about 3 times as broad as petiole; produced before the middle of each side in form of a blunt conule.

Gaster oblong, 1.4 times as long as broad.

Legs of medium size, femora and tibiae laterally compressed.

Whole body and appendages shining. Mandibles with scattered punctures and with parallel incisions near the masticatory border. Clypeus smooth and shining at the middle, longitudinally rugose at sides; the rugae continued backward to the antennal grooves. Head longitudinally rugose on front and vertex; the rugae are parallel to 4/5 of the length of the head, then they curve outward toward the occipital corners, where they are slightly anastomosed. In the middle of the head, from the clypeus to the occipital incision there is a narrow longitudinal smooth zone. Prothorax smooth, with scattered rugulae near the tubercles. Mesonotum and epinotum more or less irregularly rugulose. Petiole, post-petiole and gaster smooth. Legs and antennae with piligerous punctures.

Hairs yellow, moderately short and sparse, longer and more abundant on gaster.

Brownish yellow. Head with slightly reddish tint. Inner margin of mandibles black. Gaster infuscate, except on basal half of the first segment.

Described from one soldier collected at Caibarien, Cuba, by P. J. Bermúdez, April 1931.

This remarkable species belongs to the group of small *Pheidole* related to *P. flavens,* but is easily distinguishable by its very elongated head and strong antennal grooves.

The holotype is in the Museum of Comparative Zoölogy.

Pheidole teneriffana taina, subsp. nov.

Soldier.—Length 4 mm.

Head with the mandibles about 1.3 times longer than broad, broader at a short ditsance behind the middle of the sides. Sides convex behind the eyes. Occipital corners very convex, separated by a deep and broad occipital impression. Rest as in *teneriffana* Forel.

Thorax twice as long as broad, about ½ as broad as the head.

Post-petiole a little more than twice as broad as long.

Sculpture similar to that of *teneriffana;* rugae of the head feebler. Coloration and pilosity as in var. *avara* Santschi.

This subspecies differs from the typical form and from the var. *avara,* in having the sides of the head more convex and narrow posteriorly, the occipital impression being deeper and wider, the post-petiole larger and the striation of the head feebler.

Described from 5 soldiers taken at Holguín, Cuba, August 1930, by C. G. Aguayo.

Named for the Tainos, Indians who once inhabited the eastern part of Cuba.

The interesting *P. teneriffana,* described by Forel in 1893 from Teneriffe, Canary Islands, has been found subsequently in Tunis, Smyrna, Khartum, Mombassa, Samoa and China, offering several varieties. The finding of this new subspecies in the West Indian region, shows an addition to the remarkable geographic distribution of the species, the center of dispersion of which is hard to fix.

The holotype of this new subspecies is in the Museum of Comparative Zoölogy.

Macromischa dissimilis, sp. nov.

Worker.—Length 3.5 mm.

Head sub-oval, about 1.3 times longer than broad, broader behind the eyes, with sides straight and subparallel and with the occipital corners well rounded. Eyes rounded, convex, situated at the middle of the sides of the head. Mandibles slender, 5-toothed, with the external border slightly curved at the apical third. Clypeus rather short, very convex at the middle. Frontal area small, triangular. Antennae somewhat short, scapes convex at the apex, scarcely reaching the occipital corners. First funicular joint as long as the two following together; joints 3/8 slightly transverse; club 3-jointed, last joint slightly shorter than the two preceding together.

Thorax somewhat robust, about 2.3 times longer than broad, broader on pronotum, about 3/5 as broad as the head, and with a moderate lateral constriction between pro- and mesonotum. In profile it is very convex on pronotum and straight on meso-epinotum. Base of epinotum about twice as long as its declivity. Spines a little longer than the epinotal declivity, about twice as long as their distance apart at their base, directed upward, backward and slightly curved inward at their tips. Metasternal angles very short and blunt.

Petiole about three times as long as broad, peduncle slightly longer than node, not swollen at the spiracles. Seen from above, the outline is club-shaped, the node being as long as broad, somewhat conic. Antero-ventral tooth very rudimentary. Node about as high as long, evenly rounded before and behind. Post-petiole campanulate, as broad as long. Gaster 1.5 times longer than broad, first segment longer than the following together; tapering at the end. Sting very long, longer than half the length of the gaster.

Legs short for the genus; femora very incrassate, but not abruptly swollen, tibiae slightly incrassate.

Whole body with a waxy luster. Gaster shining. Mandibles coarsely longitudinally striate. Clypeus longitudinally striate. Whole head closely longitudinally rugose, with interstices between the rugae somewhat reticulate. Thorax rugose, rugae irregular on pronotum, transverse on meso-epinotum and longitudinal on pleura. Peduncle of petiole closely punctate, with coarse rugae on sides and behind. Legs and antennae densely and minutely punctate.

Hairs white, pointed, moderately abundant, shorter on legs, more numerous and oblique on antennae.

Head, gaster and upper surface of nodes black. Mandibles and clypeus yellow red. Pedicel of petiole, apical part of coxae, trochanter, basal half of femora and sting brownish yellow. Antennae and legs brownish black.

Described from one specimen taken at Buenos Aires, Trinidad Mountains, Cuba, May 4, 1932, S. C. Bruner and A. Otero collectors. E. E. Agronómica de Santiago de las Vegas, Cuba, No. 884.

This singular species is near the group of *M. porphyritis* Rog., but it is not closely related to any species, being absolutely different by its coloration, sculpture, shape of head, thorax and petiole, shortness of petiole and legs, etc.

Holotype in the Museum of Comparative Zoölogy.

Macromischa (*Croesomyrmex*) *lugens* Roger.

Female (deälated).—Length 8.3 mm.

Resembles the worker in shape and coloration, with the natural modifications related to the sex.

Head longer than broad, much broader behind, with rounded occipital corners. Clypeus convex. Eyes situated at the middle of the sides of head. Ocelli small. Antennae slender, surpassing the occipital corners by half of their length. First funicular joint almost as long as the next two together. All joints longer than broad; club 3-jointed, terminal joint slightly longer than the subterminal joint.

Thorax robust, very convex in profile, about twice as long as broad. Mesothorax longer than broad. Epinotum without spines. Peduncle twice as broad as node. Node in profile longer than high, regularly curved before and behind. From above longer than broad. Post-petiole as broad as long. Femora very little incrassate.

Opaque. Head, thorax, petiole and post-petiole densely punctate. Abdomen feebly shining. Head longitudinally rugulose. Occiput without rugae. Thorax longitudinally rugose on pleura, transverse on pronotum, longitudinally on mesonotum, becoming transverse on mesoscutellum. Epinotum transversely rugose. Petiole with feeble longitudinal rugae on dorsum, stronger on sides. Post-petiole minutely punctate. Gaster with minute and close punctures. Appendages with very small punctures.

Pilosity much less abundant than in worker. Hairs longer and feebler.

Color black as in worker, with brownish wing insertions.

The above description is based on a single specimen collected near a limestone cliff of the hill of Camoa, Habana, Cuba, the type locality of the species. Though it was taken dead and incomplete, it shows enough characters for a diagnosis of this undescribed sexual phase.

Macromischa (Croesomyrmex) poeyi rugiceps, subsp. nov.

Workers.—Length 4 mm.

This subspecies differs from *M. poeyi* Wheeler, by the sculpture of head and thorax and by the less incrassate hind femora.

The head, instead of being smooth and shining as in *poeyi*, is densely punctate on genae, front, vertex and occiput, the sides of the occipital area being smooth. The rugae of the genae are stronger than those of *poeyi* and extend backward through the parietal area forming a feeble, transverse, concentric striation on the vertex and middle occipital region. Clypeus densely striate in the middle, while *poeyi* has only a median carina and sometimes a feeble striation.

The thoracic rugae are more irregularly rugose on pronotum and pleura than in the typical *poeyi*. Base of petiole without, or with a very feeble transverse striation, which is very conspicuous in the typical form.

Legs longer, with the femora less incrassate than in *poeyi*, a character which is more conspicuous in the hind femora, in which the swollen portion is longer.

Thorax of a darker red color than in *poeyi.*

Described from 7 specimens collected at "Subida al Rángel," Pinar der Río, Cuba, by P. J. Bermúdez, July 1930, and 2 specimens taken at the same place by C. G. Aguayo, April 1930.

The cotypes of this subspecies are in the collections of the Museum of Comparative Zoölogy, of W. M. Wheeler, and that of C. G. Aguayo.

Macromischa (Croesomyrmex) bermudezi Wheeler var. **gracilis,** var. nov.

Worker.—Length 3.3 mm.

Differs from *bermudezi* by its smaller size, narrower body and feebler sculpture of the thorax.

The height of the thorax is smaller in proportion to its length than in the typical form, being 1 :3.2 in *bermudezi* and 1 :2.6 in this variety.

The thorax is densely and finely punctate with a few obsolete, transverse striae, visible in certain positions. The epinotum has fine transverse striation. The pleura are finely punctate, without the longitudinal rugae of the typical form. The peduncle of petiole is finely punctate, without the transverse striation of *bermudezi.*

Head petiole, post-petiole, gaster and appendages black. Thorax and epinotum dark red. Dorsal portion of the pedicel and the anterior side of petiolar node brownish red.

Described from one specimen taken at Sierra de la Guira, Pinar del Río, Cuba, July 1930, by P. J. Bermúdez.

The holotype is in the Museum of Comparative Zoölogy.

Cyphomyrmex rimosus Spin. var. **arnoldi,** var. nov.

Close to the var. *minuta* Mayr, but differing from it as well as from the typical form, by having uniform darker coloration of head, thorax and gaster, and a remarkable accentuation of the height of the ridges and tubercles of the head, thorax and epinotum.

The tubercles of the thorax are long and pointed, instead of short and blunt. The area between the tubercles of the mesothorax is more depressed and narrower. The ridges and tubercles of the epinotum are higher, those of petiole, post-petiole and gaster are similar to those of var. *minuta.*

Body and antennal scapes uniformly brownish black. Mandibles, legs and antennal funiculus paler.

Four workers from Ocho Ríos, Jamaica, March 1932, W .B. Arnold coll.

Cotypes in the collections of the Museum of Comparative Zoölogy, of W. M. Wheeler and of the author.

Brachymyrmex minutus Forel.

Three specimens of this little yellow species were taken at Salto de Manantiales, Candelaria, Cuba, April 23, 1932, C. G. Aguayo collector. Was not previously recorded from this island.

Brachymyrmex heeri Forel.

The typical pale form of this species has not hitherto been found in Cuba. One specimen was found at Sierra de la Guira, Pinar del Río, Cuba, April, 1930, P. J. Bermúdez collector.

Prenolepis gibberosa Roger.

Roger described this species from material collected by Gundlach in different localities of Cuba. He had probably specimens representing several color varieties, for he described the species as being "yellowish red or dark red." I have examined large numbers of workers from several parts of the island, and I believe there are four or five distinguishable varieties.

The form considered by Mann as typical *gibberosa* has been named by Santschi var. *albimaculata,* differing from the typical species by its smaller size and the white coloration of the tip of the antennae and the articulations of the femora.

A single worker taken by Thomas Barbour at Cafetal Pedro Díaz, Oriente, Cuba, and a large series of workers collected by W. M. Mann at Diquini, Haiti, in the miscellaneous material of the Museum of Comparative Zoölogy, seem to represent the typical form of this interesting species, which has not been previously reported from Haiti. The head, thorax, petiole and appendages are yellowish red, the gaster is black. Whole body exceedingly opaque. Erect hairs of head and thorax long and scarce. Pubescence of the body scarce.

Prenolepis gibberosa Roger var. *rogeri* Mann.

Described as being larger, with darker coloration and with shining gaster. There are transitions in size and luster, but the var. *rogeri* differs from the typical form by darker coloration. The petiole is always darker than the thorax in this variety, being of the same coloration as the thorax in *gibberosa.* The antennae and legs are darker than in *gibberosa,* the pilosity more abundant and the gaster more shining.

Female.—Length 3.8 mm.

Head, with the mandibles, 1.2 times longer than broad, ovoid, wider behind. Eyes large, about ¼ as long as the head, located about the middle of the sides of the head. Ocelli large. Antennae very long; scapes as in worker; funicle with all the joints longer than broad. Clypeus convex, slightly carinate at the middle, posterior border concave. Frontal carinae feeble. Frontal area well developed. Pronotum flattened above. Pro-mesoscutum very convex in front. Epinotum without gibbosity.

Wings transparent, brownish red. Petiolar node broader and thicker than in the worker. Gaster similar. Sculpture as in worker. Pilosity on head, thorax and gaster longer than in worker.

Color and luster as in worker.

Described from four females collected at Rángel Arriba, Pinar del Río, July, 1930, C. G. Aguayo collector.

Camponotus (Tanaemyrmex) bermudezi, sp. nov.

Worker.—Length 6.5–7.5 mm.

Head with the mandibles about 1.5 times longer than broad, narrower behind. Sides straight, occipital border well rounded. Clypeus 1.5 times broader than long, convex, keeled at the middle, front margin convex, posterior margin concave, with a deep incision. Mandibles 6-toothed. Antennal scapes very slender, surpassing the occipital corners for more than half of their length. Eyes rounded, very convex and prominent, situated a little behind the middle of the sides of the head, at a distance of about their length from the occipital corners.

Thorax long and narrow. Pronotum about as broad as the head. Mesonotum ⅔ as broad as the pronotum. Epinotum with the basal surface straight, 3 times as long as its declivity. Pro-mesonotal suture very deep, meso-metanotal suture well impressed. In profile, the pronotum is straight, forming an obtuse angle with the meso-epinotum which is concave at the middle, slightly saddle-like.

Petiolar node higher than broad, wedge-shaped, slightly inclined forward, rounded above. Gaster oblong.

Legs very slender, first pair of coxae very long. Femora compressed. Somewhat shining all over. Gaster smooth and more shining.

Whole body and the antennal scapes with microscopic, transverse, wavy striae, less conspicuous on gaster.

Pilosity scarce. Erect hairs yellow, longer on head. Appressed hairs more abundant on appendages. Pubescence of antennae more dense on funicles.

Head, thorax, petiole, mandibles and antennal scapes ferruginous red. Gaster piceous black. Antennal funiculus dark brown. Legs brownish yellow.

Described from eight specimens taken by P. J. Bermúdez at Caibarien, Cuba, April, 1931.

Cotypes in the collections of the Museum of Comparative Zoölogy and of C. G. Aguayo.

The workers have the general appearance of *C. santosi* Forel, from which it is readily distinguishable by the shape of the head, profile of the thorax, pilosity, coloration, etc.

I do not hesitate in describing this species from the workers alone, because they are absolutely different from any other Neotropical *Tanaemyrmex* known to me.

Named for its discoverer, who has contributed with the finding of many new or little known species of ants, to the knowledge of the Cuban Formicidae.

Camponotus (Manniella) sphaericus rufipilis, subsp. nov.

Worker.—Length 5.5 mm.

Differs from *sphaericus* by the following characters. Eyes situated about their length from the occipital corners (much nearer in *sphaericus*). Head longer than broad, much longer than in *sphaericus.* Surface of body more shining. Appressed hairs squamiform, as in var. *sphaeralis* Rog. Hairs of the gaster, both erect and squamiform, of golden red coloration.

Differs from *sphaeralis,* to which it resembles by having squamiform hairs, by its larger size, shape of the head, shape of the thorax and coloration of the hairs of the gaster. The dorsal surface of prothorax forms a right angle with the epinotal declivity, while in *sphaeralis* the said surfaces form a more obtuse angle.

Described from two workers taken at El Tigre, Calabazar de Sagua, Cuba, August, 1931, P. J. Bermúdez collector.

The cotypes are in the Museum of Comparative Zoölogy and in the collection of C. G. Aguayo.

This form might prove to be a different species, when the soldiers are examined, as it is quite different from the known species of the subgenus *Manniella.*

Camponotus torrei, sp. nov.

Worker.—Length 5.8 mm.

Head with the mandibles slightly longer than broad, somewhat broader behind, with their sides straight and the occipital corners slightly rounded. Vertex very convex. Antennae slender, scapes surpassing the occipital corners by 1/3 of their length; funicular joints longer than broad. Clypeus broader than long, slightly convex at the middle; with somewhat convex anterior border and concave posterior margin. Frontal area small. Frontal carinae well developed, reaching to opposite the middle of eye. Eyes very convex, situated at the sides of the head, at a distance of one half their length from the occipital corners. Mandibles with four very small blunt teeth, widely separated.

Thorax robust, very convex in profile. Pronotum about twice broader than long, rather flat. Mesonotum longer than broad. Declivity of epinotum flattened, vertical.

Petiole wedge-shaped in profile, similar to that of *C. sphaericus*. Gaster about 1/4 longer than broad.

Legs as in *sphaericus*. Femora compressed.

Head and body opaque, densely punctate. Antennae opaque, finely punctate. Legs finely punctate and somewhat shining. Mandibles with scattered, somewhat deep punctures.

Hairs on head and body very scarce, a little more abundant on gaster. Both erect and semi-recumbent hairs of golden coloration. Pilosity of antennae abundant and yellow colored, that of legs scarce and white.

Head, thorax, petiole, gaster, coxae, femora and first tarsal joint black. Antennae, mandibles, trochanters and tibiae brownish red. Last tarsal joints dark brown.

Described from one worker taken by P. J. Bermúdez at Sierra de la Guira, Pinar del Río, Cuba, during a trip with Dr. Cárlos de la Torre and C. G. Aguayo, July, 1930.

Holotype in the Museum of Comparative Zoölogy.

This species is closely related to *C. sphaericus* Roger, from which it differs by the shape of the head (narrower anteriorly in *sphaericus*), the position of the eyes (nearer the occipital corners in *sphaericus*), the length of the frontal carinae (shorter and feebler in *sphaericus*), the smaller mandibular teeth, the broader prothorax, the more opaque surface of body, the golden coloration of hairs and the remarkable coloration of hind femora.

I name this interesting species for my teacher, the Cuban Malacologist Dr. Cárlos de la Torre.

A NEW POTAMOBATES (GERRIDAE).

By H. B. Hungerford, Lawrence, Kansas.*

The genus Potamobates was described by Champion[1] to embrace the species *P. unidentatus* Champ. and *P. bidentatus* Champ. (1901).

No new species were discovered until Professor Teiso Esaki[2] described *P. tridentatus* Esaki and *P. horvathi* Esaki which he found in the Hungarian National Museum (1926). A fifth species was described under the name *P. osborni* by Drake and Harris[3] in 1928. I now must add a sixth species from material that was sent to me from Ecuador some years ago by my friend F. X. Williams.

Potamobates williamsi sp. n.

Size: Length of winged male 11.9 mm. Length of wingless males 11 mm., the wingless females are shorter being only 9 mm. long but somewhat plumper than the males.

Color: Body black above but marked with pale brown spots and silvery patches; venter pale. Head light brown above and paler beneath. The antennae for the most part dark brown. Beak with basal two segments and base of third segment pale. Pronotum black with a large triangular pale brown spot in the middle and silvery patches on the anterior half at the sides. In the winged individual the well developed pronotum is broadly margined with pale brown on the caudal half and a faint pale median line extending from the triangular patch in front to the pale margin behind. The mesonotum black bordered laterally with silvery pubescent bands and marked above by three pale brown figures, variable in shape. The median one may be a thin line broader behind and not attaining either front or rear margin or a broad band of uneven width. The lateral spots may be small and nearly round, triangular or quite elongate triangular figures which in one specimen have the inner angle united with the median line. The rear margined by thin line of silvery pubescence that joins to large triangular spots below which are silvery patches on the acetabula. Metanotum black with or without

* Contribution from the Department of Entomology, University of Kansas.

[1] Biologia Centrali Americana, Insecta, Rhynchota Hemiptera-Heteroptera Vol. II, p. 154, (1901).

[2] Annales Musei Nationalis Hungarici, Vol. XXIII, pp. 251–257. (1926.)

[3] Proceedings of the Biological Society of Washington, Vol. XLI, p. 25 (1928).

a light brown median spot that may be large and triangular or reduced to a line. Silvery patches on the acetabula. Abdomen black above with silvery pubescence laterally. The males with a light brown median spot on each segment beyond the first. Connexivum black usually with pale spots below on last segment. All coxae pale. Front femora light brown above dark below. Front tibiae and tarsi dark. Middle and hind legs brown with longitudinal dark stripe above and below on each femur. A short black streak on base of the cleft of the acetabula of the mesothorax.

Structural characteristics: Head about twice as long as broad between the eyes at the base. Antennal formula: 1st: 2nd: 3rd: 4th: : 10: 3.2: 3.6[4]: 4.7. The antennae turned backwards would not quite attain the rear margin of the mesonotum in the apterous male. Tip of beak barely attaining anterior margin of front coxae. Pronotum transverse, a little longer than half the width and slightly shorter than the length of the head. Humeri of winged specimen somewhat elevated and the margin behind sinuate on the sides, rounded at the apex. Mesonotum slightly more than three times the length of pronotum measured on dorsal line. A faint median depressed line more conspicuous on caudal third. Metanotum as long as the pronotum, both anterior and posterior margins concave. Anterior legs short. Femur of male incrassate, width is to the length as 7: 24. Five or six stout bristles in a longitudinal row on dorsal surface near the base, femur of female a little longer and not so broad. Tibia as long as the femur, longer than the margin opposite, projecting at inner side of apex, longitudinally depressed within, slightly incurved on distal half, its diameter less than one-third that of femur in male and greater than one-third in female. Tarsus trifle less than one-fourth length of tibia, first segment one-third as long as the second. Intermediate and posterior legs very long and slender. Intermediates the longer and stouter. Intermediate femur a little shorter than length of the insect. Formula for intermediate leg: Femur: tibia: tarsus: : 17: 12: 7. Tarsus tapering and curved, first segment three times as long as the second. Formula for posterior leg: Femur: tibia: tarsus: : 18: 10+[5]: 1.5. The posterior tarsus small, first segment longer than the second. The tergum of first abdominal segment fitting into the narrow posterior incision of thorax. The seventh abdominal tergite in the male a little longer than the two preceding tergites; in the female only two-fifths longer than the sixth tergite. In the male the connexivum triangularly produced behind. In

[4] Includes the short but very plain intersegment.

[5] Curved at distal end and difficult to measure.

the female the connexivum overlaps lateral margin of last tergite and is produced into a long, finger-like, somewhat incurved process longer than last two tergites and surpassing the genital segment by nearly half its length. The first genital segment of male measured on median dorsal line as long as four preceding abdominal tergites. The general shape of this segment much like *P. tridentatus* Esaki but having the large marginal teeth relatively larger and farther apart and posterior ventral margin with a much narrower concavity than in *P. tridentatus* Esaki. The hook-like tooth of the second genital segment begins to the right of the median line and terminates in the cleft between the other two teeth. The female genital segments much as in *P. tridentatus* Esaki. The connexivum terminating in a longer process. The V-shaped incision on the posterior margin of the sixth ventral segment of female cutting about half the length of that segment.

Distributional notes: The series from which the above description is drawn came from Tena and Mera, Ecuador, and were taken in February by F. X. Williams.

Location of types: Holotype, allotype, holomorphotype and paratypes in Francis Huntington Snow Entomological Museum, University of Kansas, and two paratypes in Professor Esaki's collection.

Comparative notes: This species is near *Potamobates tridentatus* Esaki from which it differs in the color pattern and (in the male genital segments) in having the acute teeth 1 and 2 farther apart and the number 3 closer to 1 and 2. The ventral posterior margin of the first genital has a narrower concavity. Specimens were sent to Professor Esaki who kindly compared them with his *P. tridentatus*. He writes: "*Potamobates williamsi* Hungerford is distinct from *tridentatus* Esaki. I have 1 ♂ and 1 ♀ paratype of my species and compared your specimens with them carefully. (1) *Williamsi* is much stouter in shape, and the legs are also stouter than in *tridentatus*. (2) ♂ genital segments are much larger in comparison with the rest of abdomen than in *tridentatus*. They are almost equally as long as the rest of abdomen in dorsal aspect in *williamsi*, while they are distinctly shorter than the rest of abdomen in *tridentatus*. (3) The differences in male genital segments are very correctly pointed out by you. It is especially distinct, in that the posterior margin of the first ventral segment shows a much narrower concavity than *tridentatus*. (4) the patterns on mesonotum are practically absent in *tridentatus*, though this character is not always stable."

THE EFFICIENCY OF TRAPS IN CONTROLLING THE EUROPEAN EARWIG, FORFICULA AURICULARIA, LINN., IN BRITISH COLUMBIA

Geoffrey Beall
Dominion Entomological Laboratory, Chatham, Ontario

Introduction

Object

The possibility of controlling the European earwig, *Forficula auricularia,* L., by trapping was investigated in 1929 at New Westminster, British Columbia. This research resolved itself into three problems: first, to test the relative efficiency of different traps; second, to determine the value of baiting traps; and third, to consider the efficiency of trapping in general as a control measure.[1]

General Procedure

One hundred and ten simple traps of seven types were set out on eleven widely separated city lots. Eight of these lots were well-kept gardens, one was a deserted garden, one a small orchard, and two unimprovd lots covered with bush and grass. On eight lots, referred to as "trapped lots," the earwigs were destroyed as captured, and on three lots, used as controls, the insects were returned to the ground near the trap after the count had been made.

Relative Value of Various Traps

From May 7 to July 30, 1929, a comparison was made of the seven types of traps. These may be divided into two groups, those in the trees and those on the ground. The traps of each group were compared with one another, but not with those of the other group.

Types of Tree Traps

The first group, those in the trees, consisted of three types of traps:

---

[1] This work was carried on under the direction of Mr. R. Glendenning, Dominion Entomological Branch, to whom I am greatly indebted for advice and assistance. Publish by permission of Mr. A. Gibson, Dominion Entomologist and Prof. C. M. Fraser, Department of Zoology, University of British Columbia.

Material	Situation	Terminology used in following discussion
1. Large jute sack	Wrapped tightly around trunk of tree	"wrapped sacking"
2. Large jute sack	Bundled tightly into crotch of tree	"bundled sacking"
3. Double sheet of newspaper	Bundled tightly into crotch of tree	"bundled paper"

These traps were situated mainly in apple and plum trees about eight inches in diameter, and were placed approximately five feet above ground.

Procedure in Comparative Tree Trapping

Catches were made from eleven trees for comparison between the traps, "wrapped sacking" and "bundled sacking," as described above. Each tree had either "wrapped sacking" or "bundled sacking." These were alternated daily; "wrapped sacking" became "bundled sacking" when its arrangement in the tree was changed. From these data it was possible to calculate the relative efficiency of each kind of trap for each tree.

Just as the two previous types of traps are compared, so may the "wrapped sacking" and "bundled paper" be compared. Similarly, the two arrangements were alternated and comparisons made.

Results of Tree Trapping

The calculation for the first pair of types of traps is as follows:

1. For each type of trap the median catch is determined in each tree over the entire period. By a comparison between the two medians the relative efficiency of the two types from one tree is determined and this is expressed as a ratio like—"wrapped sacking" : "bundled sacking" : : 120 : 100.

2. Since there was some variation in the relative efficiency between the different trees, the median ratio from the eleven trees was chosen. The final ratios obtained in this way were: "bundled sacking" : "wrapped sacking : : 75 : 100. The results varied from 90 : 100, to 53 : 100, with one extreme case of 35 : 100.

The calculation for the second pair of types of traps is similar to that for the first. The results obtained were: "wrapped sacking" : "bundled paper" : : 100 : 315.

Summarizing the results of quantitative trapping, it may be said that wads of paper in trees are three times as effective as sacks around trees and four times as effective as sacks bundled up. On the other hand, the relative convenience in handling the three traps is in the opposite sequence. Tree traps composed of sacks bundled up are the most easily emptied, since they have only to be shaken over a vessel or paper. From the sacks around trees the collection is slow, since the earwigs must be largely picked off the trunk individually. A wad of paper in the tree takes a great deal of time to empty. It is, further, rather unsightly.

Types of Ground Traps

Traps were placed on the ground in any situation in which earwigs were likely to occur. They were of the following nature:

Material	Situation	Terminology used in following discussion
4. Medium sized flower pot half filled with grass	On stake about 8 inches above ground	"Flower pot"
5. Tin can averaging 3 inches in diameter and 5 inches deep, half filled with loose newspaper	On stake about 8 inches above ground	"Tin can"
6. Sections of dry dahlia stems	Laid on the ground	
7. Sections of bamboo, node and internode	Laid on the ground	

Procedure in Comparative Ground Trapping

Catches are available for comparison of the efficiency of the first two types of ground traps. In four situations "flower pot" and "tin can" were placed within six inches of one another, thus forming a series of double traps. At the time of each collection the positions of the pair were interchanged. The supporting stakes were left in the ground.

Results of Ground Trapping

The total catches during the season for the two preceding types of traps from each of the four positions are compared below:

	Double Trap I	Double Trap II	Double Trap III	Double Trap IV
"flower pot"	177 earwigs	152 earwigs	61 earwigs	379 earwigs
"tin can"	81 earwigs	44 earwigs	17 earwigs	107 earwigs
pot/tin	218/100	345/100	359/100	354/100

If the index from the median double trap be chosen, the results are: "flower pot" : "tin can" : : 350 : 100.

More earwigs, particularly nymphs, were found to enter the "dry dahlia stems" than bamboo sections. It is possible to empty both of these types of traps much more rapidly than any other device employed during the season. This may be done simply by jarring them.

Conclusions as to the Efficiency of Both Tree and Ground Traps

Among the particular sites chosen in 1929 the tree traps averaged four or five times more earwigs than the ground traps. This is apparently due to the fact that earwigs climb freely, particularly after having completed the second instar. In almost any tree, earwigs could be trapped in large numbers, whereas places on the ground in which they occurred freely were difficult to locate. The catch from the ground traps on stakes and the tree traps showed no appreciable decrease in the latter part of the season, such as occurred in the dahlia stems and bamboo sections. Since the earwigs eat dahlias, as might be expected, the catch for the traps "flower pot" and "tin can" was increased when the supporting stakes were set among dahlia foliage.

Relative Value of Two Types of Baits in Traps

Kinds of Bait

The two kinds of bait used were meat fat, and sugar. The first was simply kitchen beef dripping and the second was lump sugar.

Procedure in Baiting

Just as a comparison has been made between the catches from pairs of different types of traps set beside one another, in order to demonstrate their relative efficiency, so the baited and non-baited traps were evaluated. The non-baited trap of each pair served as a control. The catches from seven such double traps are compared. In each of four of these double traps, which were on the ground, the two traps, including the supporting stakes, were interchanged at each collection of earwigs. In three double traps in trees the bait could not be interchanged between the members of each pair daily, because some of the bait became smeared on the tree itself. From June 14 until July 10 each of the seven traps was baited with one of the two types of bait, and from July 11 to July 30 each trap was baited with the opposite type to that of the previous period.

The method of baiting traps is simply to rub the fat on the sacking or paper, or to place the sugar in the folds of the same at intervals of about three days.

Results on Baiting

The accompanying table shows the total catch during the season from double traps, one part of which was baited and the other not:

Number of Earwigs Taken in Double Traps in Testing Baits

Number and location of double trap	June 13–July 10			July 11–July 30		
Tree	Sugar	Dripping	Control	Sugar	Dripping	Control
I	28		39		345	240
II		563	317			
III	8		32		34	88
Ground						
IV		249	93	15		28
V		45	37			
VI	28		40		45	48
VII	35		18		26	17

In each pair of double traps the total catch from the baited part is compared with the total catch from the control part, and the result expressed as a ratio. In calculating the effectiveness of each kind of bait the results from the trap with the median ratio are selected as characteristic.

Dripping : Control : : 144 : 100

Sugar : Control : : 70 : 100

The use of beef in the traps materially raised the number of earwigs caught. This bait was very satisfactory to handle and also remained in the traps in spite of rain or heat. On the other hand, the presence of the lumps of sugar reduced the number of earwigs hiding in the traps. In all these the sugar attracted a small yellow ant, which may have driven away the earwigs and thus have occasioned the reduction in catch.

Trapping in General as a Control Measure

Results of Trapping

Apart from the problem of the relative efficiency of different methods of trapping is the question of the value of trapping in general as a control measure. In order to answer it, a great number of earwigs were destroyed on the eight separate lots where trapping was practiced. One hundred traps, including those on the immediate surface of the ground, were maintained during May, June and July, 1929. The most productive were continued over August and September. About 45,000 earwigs altogether were destroyed. On the most heavily infested lot, one of small size, although 14,000 were taken in two months, counting all means of collecting, no marked decrease in the number of earwigs occurred. It appeared everywhere that the extent to which the earwig population of a trapped lot was depleted depended upon the extent of immigration from neighboring untrapped lots. This migratory movement was apparently vigorous at most times during the season.

Evidences of Depletion in Earwig Population.

Interpretation of Catches in General.

In the spring when the population consisted of feeble, dying, overwintered adults, the number of earwigs taken on the trapped lots fell more rapidly than that of the control lots (May 8–29). Apparently the depletion in the population was not made good by immigration from non-trapped lots. However, upon the appearance of the first and second instar nymphs, the catch on the trapped lots rose so that it stood at practically the same level as the catch on the control lots. That is, in both cases the yield at the height (June 10) of this period (May 29–June 18) was about 2.5 times as great as the initial catch of adults on May 8. Since the nymphs had been mothered under ground, they apparently represented a virtually untrapped portion of the original population. After June 11, however, a rapid decline in the numbers caught on trapped lots, as compared with the controls, set in. This decline was apparently occasioned by the failure on the part of the inactive first and second instar nymphs to recoup by immigration those losses incurred through the trapping. When the rapidly migrating third and fourth instar nymphs and vigorous autumnal adults formed the bulk of the earwig population (June 18–Oct. 5), the catch from the trapped lots, as compared with the catch from the controls, showed little sign of depletion against time.

Interpretation of Fluctuations in Catches.

Let it be assumed that immigration of earwigs from adjacent lots played an important part in maintaining the population level on trapped lots. It would appear that in a period during which the activity of the earwigs fell, the number getting into control traps would be reduced, even if they had only to move two feet. Under the same conditions the number of earwigs moving a considerable distance from another lot would show an even more marked decrease. The converse situation would appear in periods favorable to migration. It would appear also that the essential difference between trapped lots and control lots would lie in this difference in distance which the insects had to traverse. If so, one would expect more vigorous fluctuations in the number of earwigs taken from trapped lots than from control lots. This supposition is supported by the catches of earwigs taken during the period July 25 to Oct. 5, when the population consisted of big, freely moving nymphs and young adults.

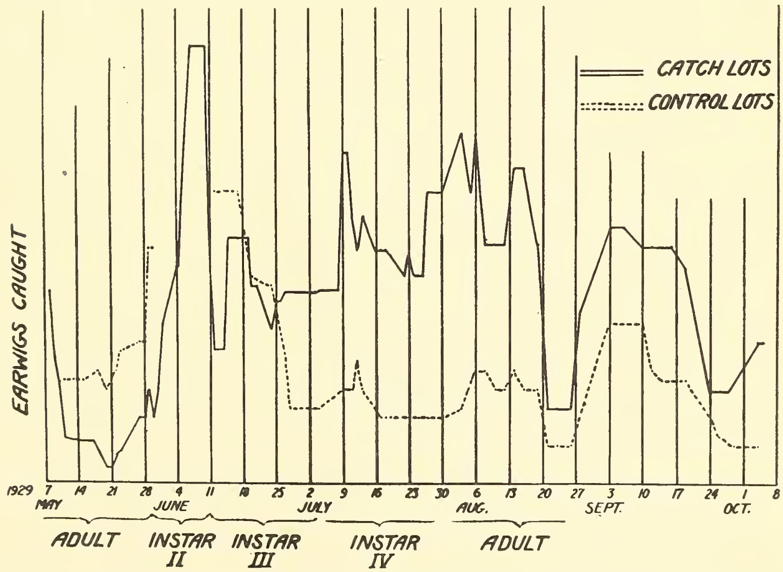


Fig. 1—Catches from trees on trapped and control lots, smoothed.

The earwig catches throughout the season for both trapped lots and control lots are plotted on the accompanying chart. Both curves are smoothed with a three day moving average. The two curves are at approximately the same height, although that is not significant. The slopes, not the altitudes, are to be compared. The time axis is marked off to show the group of earwigs predominating in the catch from the trapped lots.

Conclusions on Trapping.

In conclusion, it may be said that trapping on a single lot caused some lowering of the level of population. However, rapid infiltration from surrounding non-trapped lots nullified these results on the whole.

Summary of Conclusions.

1. Profitable traps can be located more readily in trees than on the ground. Apparently, this is the case because the earwigs climb so freely that they tend to concentrate in the trees.

2. (a) Jute sacking bundled in the crotch of a tree is the most effective trap for earwigs, because, although it does not attract many earwigs, it can be emptied with a minimum of effort.

(b) Jute sacking tied around a tree is about 1.3 times as effective as a sack bundled up, but requires a disproportionate amount of time to empty.

(c) Newspaper bundled in the crotch of a tree gives about four times as many earwigs as a sack similarly arranged. However, a considerable time is required to empty such a trap.

(d) Old, dry dahlia stems laid on the ground are very efficient in catching young nymphs. Bamboo sections are markedly less so.

(e) Inverted pots with grass, placed on stakes are moderately profitable when set among dahlia foliage. They are 2.5 times as efficient as tins containing newspaper, similarly placed.

3. Kitchen beef dripping applied to traps was found to raise the catch of earwigs 1.4 times over that of unbaited traps. Lump sugar reduced the catch of earwigs, possibly because it attracted many ants and these tended to disturb the earwigs.

4. A comparison of the catch from lots on which earwigs were destroyed and from control lots showed a certain amount of depletion to occur in the former. However, migration of earwigs is so rapid as to make trapping valueless as a control, if only practiced on one lot.

NOTES ON SOME HALTICINAE WITH DESCRIPTIONS OF NEW SPECIES (COL. CHRYSOMELIDAE).

By Chas. Schaeffer, Brooklyn Museum, Brooklyn, N. Y.

Hamletia dimidiaticornis Cr.

In his revision of the Halticini Dr. Horn says of this insect that it "seems to be one of the rarest of our Halticides." It is recorded so far only from Georgia and Florida. It has been taken at Mobile, Alabama (Loding) ; Southern Pines, South Carolina (Manee in Coll. Cornell Univ.) and Cape May, New Jersey, (Wm. T. Davis).

The coloration of the antennal joints is variable, the first three and the last two are only pale in some males, in a female, which sex was unknown to Dr. Horn, the antennae are black with the last joint more or less pale and in form is broader than the male.

Oedionychis interjectionis gracilis Jacoby.

In the Leng Catalogue this Mexican form is doubtfully recorded as occurring in the U. S. and Mrs. Blake in Proc. N. S. Nat. Museum, vol. 70, p. 15, places *gracilis* as synonym of *interjectionis.*

Typical *gracilis* apparently do not occur here in the U. S., they have the subsutural white elytral vittae entire and of equal width from base to not quite to apex, in the North American specimens with entire white vittae the apical part of the latter is always wider more or less strongly dilated, extending to the white lateral margin in some specimens. I have seen a few Mexican specimens from Presidio, and a great number of our insect, especially from Texas, where at Brownsville I found it very common, but not one of these from the latter locality had the white vittae of equal width throughout as in the Mexican specimens; the ground color of elytra is apparently also more distinctly metallic green in the Mexican insect.

Oedionychis petaurista brevilineata Horn.

In this black variety the narrow, short pale linear vitta on each elytron is present either at base or sometimes at apex.

Oedionychis flavocyanea Cr.

Described and recorded only from Texas, this species occurs also in Arizona.

Haltica kalmiae **viridana** n. var.

Differs from typical reddish cupreous *kalmiae* in being entirely metallic green. Virginia: Mt. Vernon (Mrs. Blake), Skylight (Quirsfeld), Glencarlyn (Bridwell), Great Falls (Knab); Maryland: Montgomery Co. (Shoemaker); North Carolina: Balsam (Wenzel); Tennessee: Flat Top Mt., Unaka Spgs. (Siepmann). The type is a specimen from Mt. Vernon in the coll. of the Nat. Museum, paratypes in the Nat. Museum and my own collection. This form was taken by Mrs. Blake, Messrs. Knab and Bridwell on *Kalmia latifolia* and by the latter also on *Azalea*.

The four small, cupreous-golden eastern Halticas with deep, entire ante-basal groove of prothorax look superficially very much alike and may cause a little difficulty in separating them. The following brief notes are given to assist in the identification of these four species.

Haltica ignita Illiger.

This species is at once readily distinguished from the others by both sexes having a more or less distinct lateral plica or fold on each elytron, which is usually rather faint basally but distinct near its apex. The reddish color is often suffused with green or greenish blue above and below. The broad ante-scutellar lobe of prothorax is always distinct.[1] The elytral punctures are rather sparse and moderate in size.

The lateral plica of the elytra, though variable in distinctness is apparently never absent, at least, in the twenty odd specimens of both sexes from different localities seen, this plica, though variable, was present in all. According to the labels on specimens from New Hampshire, South Carolina, Maryland, Virginia, and Alabama it is apparently found only on different species of *Prunus*.

Haltica rosae Woods.

Nearly of the same form as *ignita* with similar sparse elytral puncturation but with never a trace of a lateral elytral plica. The basal margin of prothorax is rather evenly arcuate-truncate and without ante-scutellar lobe; the surface is usually less shining than in the *kalmiae* and more or less alutaceous especially the basal area of the pronotum between the ante-basal groove and basal margin.

[1] This ante-scutellar lobe of prothorax is apparently better developed in the females than in the males.

Of this species I have seen specimens from Maine, Massachusetts, New York, New Jersey and Iowa. Its principal food plant is the wild rose.

Haltica kalmiae Welsh.

This is generally a little larger than *rosae* and *ignita,* with slightly more elongate and somewhat more parallel-sided elytra and the punctures of the latter usually larger and more numerous. The basal margin of prothorax has a more or less distinct broad ante-scutellar lobe. Elytral plica absent.

It occurs on several species of laurel and occasionally on wild *Azalea* and is the common species mostly found in the eastern states.

Haltica pretiosa Blatchl.

This species is very much like *kalmiae* but the elytra are more regularly oval, the puncturation is generally coarser and the antebasal groove of prothorax is less deeply impressed at middle, occasionally very faint and almost obliterated, but is always distinct at sides. The ante-scutellar basal lobe of the prothorax is rather feeble in the few specimens of both sexes seen. It was described from Indiana, but I have found specimens at Yaphank, Long Island, on the leaves of the wild rose.

Haltica corni Woods.

Of this species, which is recorded from Michigan, Wisconsin, Maine, Massachusetts and New York, I have a single specimen from New Braunfels, Texas.

Haltica oregonensis n. sp.

Male: Elongate-oval, dark aeneous, surface shining, below and legs black with a more or less metallic tint. Head smooth with a few punctures near the eyes, frontal carina obtuse, tubercles distinct; antennae reaching to about middle of elytra, black, joints three and four scarcely differ in length, outer joints nearly equal but slightly stouter. Prothorax nearly twice as wide at base than long, sides feebly arcuate and slightly narrowing towards apical angles, the latter thickened, basal angles obtuse, slightly rounded; basal margin almost evenly rounded; surface very finely and sparsely punctulate, punctures scarcely visible on the disk but more evident and closer near anterior angles; ante-basal transverse impression obliterated on the disk but distinct at sides. Elytra slightly wider at base than the prothorax, humeral angles rounded, umbo feebly distinct; irregularly and nearly equally punctate from base to apex, punctures moderately coarse, and only slightly smaller near apical margin rather much larger than those of the prothorax. Ventral segments moderately punctate, last segment with a broad median lobe with a distinct transversely impressed line near its apical margin and above this the surface is feebly depressed. Length 4 mm.

Waldport, Oregon.

The almost smooth and shining pronotum with obliterated ante-basal impression and the relatively coarsely and from base to apex nearly equally punctate elytral together with its rather elongate-oval form ought to make this species an easily recognizable one.

Haltica subopaca n. sp.

Moderately elongate-oval, surface subopaque, dull blue, underside more shining, black with more or less bluish tint, legs more distinctly blue. Head smooth behind the eyes, a few, rather coarse punctures near the latter; frontal tubercles flat, distinctly limited above by a finely impressed line; frontal carina obtuse; antennae black, about one half as long as the body, third and fourth joints nearly equal in length, outer joints very slightly thicker. Prothorax a little wider at base than long, sides slightly arcuately narrowing to apical angles which are feebly thickened; disk convex, the ante-basal line distinctly impressed, but generally not deeply so, evanescent at sides, surface more or less alutaceous, distinctly but finely punctulate; basal margin rather evenly arcuate without ante-scutellar lobe. Elytra slightly wider than the prothorax at base; humeri rounded, humeral callus indistinct; surface alutaceous, dull, distinctly punctate, punctures moderate and slightly smaller towards apex. Ventral segments finely and sparsely punctate, the first two a little more coarsely. Length: 3.5 mm.

Arizona: Huachuca Mts., June, (Schaeffer); Phoenix (Kunze); Sierra Ancha Mts., July (Duncan).

Type and paratypes in National Museum collection, paratypes in my collection.

The last ventral segment of the male at apex is slightly sinuate on each side, median lobe moderate, feebly flattened at middle and with a more or less distinct longitudinal impression at apex.

The impressed ante-basal line of prothorax is variable, in some it is rather deeply impressed in others less so, but is always distinct. The elytral puncturation varies also a good deal.

This species should be placed near *foliacea,* from which it will be distinguished by the dull, not shining upper surface, distinct ante-basal impression of prothorax and distinctly punctate elytra together with the rather shorter and somewhat more convex form; some of these characters will also separate it from *H. brisleyi* Gent., which is a slightly larger insect.

The old genus *Crepidodera* has been divided into several genera in Europe and some of our species formerly listed as *Crepidodera* have been properly transferred to the correct genera in our recent catalogue. However, the following three species are still listed under the genus *Crepidodera,* which, following the European catalogue, should be transferred to the genera *Derocrepis* and *Chalcoides.*

Crepidodera erythropus Melsh. and *C. aesculi* Dury.

These two species belong in the genus *Derocrepis* Weise the species of which differ from *Crepidodera* in being of more elongate form, the pronotum at base with a distinct marginal bead, and the frontal tubercles of head rather large and distinctly separated above and from each other and the area between the transverse groove and basal margin of pronotum is more or less convex. *C. aesculi,* recorded so far only from Ohio, has been taken by Mr. Siepmann in Tennessee.

The species of *Crepidodera* are of shorter and relatively slightly more robust form, the base of pronotum is without marginal bead and the frontal tubercles are connate above or at most very obscurely separated. This latter character is present in *pallida* and *robusta* but not in *atriventris* and *nitens* in which the tubercles are separated from the frons by a distinctly impressed, transverse line.

Crepidodera longula Horn.

The elongate form, the pronotum distinctly margined at base, the frontal tubercles rather small and transverse, distinctly separated from each other and above and the area between the transverse groove and basal margin flat—convex in *Derocrepis*—places this species in the genus *Chalcoides.*

Systena variata n. sp.

Oblong, color black, each elytron with a more or less distinct pale vitta. Head shining, sparsely and finely punctate; antennae slender, joints two and three more or less distinctly tertaceous at base. Prothorax about one third wider than long, sides nearly paralled to a little above middle then slightly narrowing to apical angles, which are somewhat obliquely truncate and rounded. Lateral margins narrowly reflexed; ante-basal transverse impression very feeble, shallow; disk shining, punctures moderate, not closely placed. Elytra wider at base than the prothorax, humeri rounded, sides feebly rounded, apices subtruncate; disk shining, closely and moderately coarsely punctate. Body below shining, ventral segments and legs sparsely pubescent. Length: 3.5 mm.

Verde Val., Arizona.

The coloration of the elytra is very variable in this species. Some specimens have a very distinct pale vitta on each elytron, which is slightly curved at base, and dilated at its apex, in these the pronotum also is very narrowly pale at basal margin, other specimens have the vitta very feebly indicated or as in some there is only a more or less distinct sub-basal and ante-apical pale spot, which are occasionally only faintly visible. Specimens with entirely black elytra I have not seen but possibly occur. One specimen, which I place with this species as an extreme variation, has the antennae, head underside and legs black or piceous, prothorax and elytra pale, the latter with black vittae, one at suture and one on each side but remote from the lateral margin and extending from base to above apical fifth. The puncturation of pronotum is also variable.

Systena marginalis **corni** var. nov.

Differs from typical *marginalis* in the absence of black lateral margins of prothorax and elytra and slightly more elongate form.

Mobile, Alabama.

According to Mr. Loding this unicolored pale form occurs only on *Cornus floridanus.*

Systena discrepans n. sp.

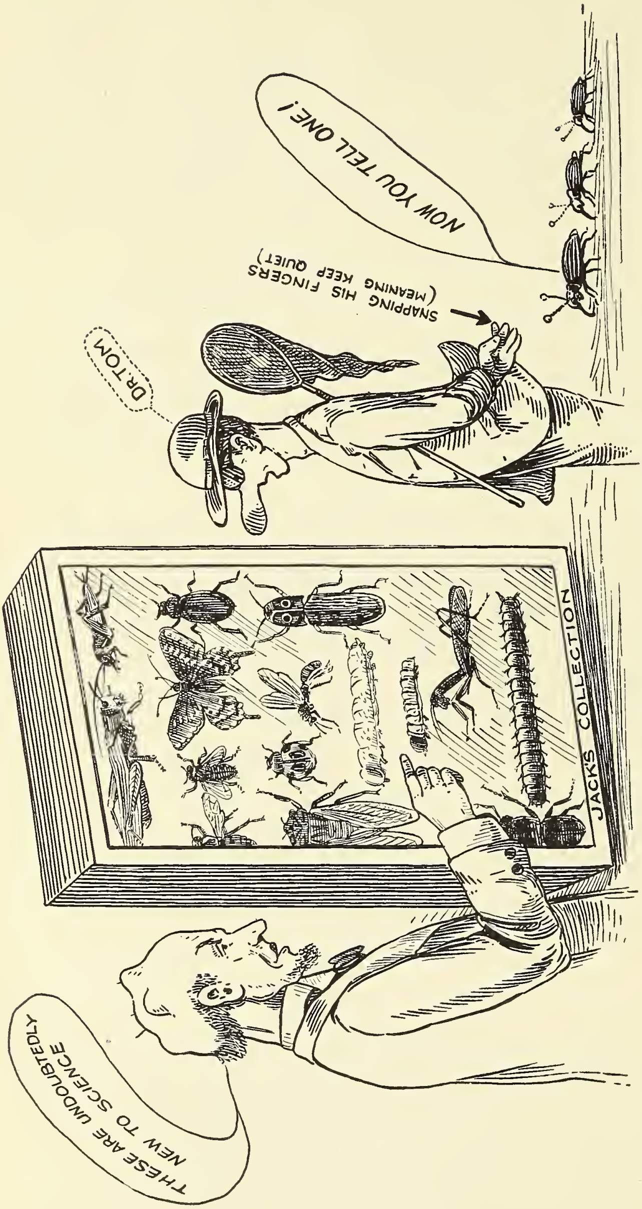
Small, moderately elongate, black, head, prothorax and elytra shining metallic-green, legs and antennae yellowish testaceous, the outer four or five joints of the latter more or less piceous. Head finely and very sparsely punctate, surface not smooth but somewhat rugose; frontal tubercles above the antennal insertion distinct; antennae slender reaching to the middle of elytra. Prothorax transverse, about twice as wide as long; sides distinctly arcuate, anterior angles slightly oblique; posterior angles distinct but obtuse; transverse ante-basal groove obliterated at middle, vague, but more visible at sides; disk finely and sparsely punctate. Elytra distinctly wider at base than the prothorax; humeri rounded, sides gradually but not strongly widening posteriorly and about twice as long as wide at base; surface irregularly, not closely punctate with moderate punctures which are less numerous and nearly obliterated in about apical half. Ventral segments sparsely punctate. Posterior tibiae not grooved on the outer edge. Length: 2.5 mm.

Huachuca Mts., Arizona (Schaeffer).

Type and paratypes in National Museum collection and paratypes in my collection.

This little species looks rather strange among our North American species but it has all the generic characters of *Systena* with the exception of the last joint of maxillary palpi which is about as long as the preceeding joint, but not longer. It seems to be allied to the Mexican *coxalis.*

Cicindela purpurea nigerrima Leng.—While looking over the Frederick Blanchard collection at the Museum of Comparative Zoology in Cambridge recently, I discovered a fine specimen of this black variety. It is labelled, "Dracut, Mass. June 4, 1887." This record antedates my Framingham specimen (Sept., 1904) by 17 years and indicates how unusual its occurrence is in Massachusetts.—C. A. Frost, Framingham, Mass.



Jack of All Orders—Gunder.
(Text on opposite page)

JACKS OF ALL ORDERS.

By J. D. Gunder, Pasadena, Calif.

[You read about Dr. E. N. Tom Ology in the last issue where he was *lost in the American Forest of bad Original Descriptions.* "Well," said Dr. Tom, "that was an easy forest to get out of. Once, when in Europe, I came near never getting out of several. They are so bad in Germany, even their own entomologists call them Black and that's going some! If I remember right, it was down in Italy in the Roger Verity Forest that I had the worst time. They don't even make an effort to thin out the excess timber in that original description forest, but just keep on planting new trees of the same kind to make it denser. No types of any kind ever designated at all; no dates; few definite type localities given and just enough non-technical description to get by, plus the new names in bold-face type (unless they overlook it) to show that they are new. If it was not for the use of the bold-face type, one would scarcely know he was reading an original description. Paragraphed units are unknown. If you don't believe me, see recent numbers of the *Entomological Record and Journal of Variation*; for example, pages 120–121 of the late September, 1932, issue. Wonder why Roger Verity doesn't perfect his O.Ds. along modern lines? Maybe the new names are personal property and what they stand for are state secrets not to be fully revealed unless one pays ocean or train fare to Italy to examine types which evidently don't exist anyway. Well—it's their own stew boiling over their own fire, at any rate."]

Dr. Tom took a day off not long ago and came into the big City. He really had two reasons for coming; the most important to him was his desire to see the wonderful Jack Collection of insects which he had never seen, but had heard much about and the other was to go to the circus. He knew Jack to be a famous entomologist of the old school. "I had a great time that day," said Doc. "In the morning I saw Jack's stuff with all his BUTTERFLIES, BEES and BUGS; no specialty there and in the afternoon I went to the circus. I enjoyed the big tent. The way that expert could juggle his BUCKETS, BASKETS and BOXES, all at one time, was marvelous. What a man! He certainly can put it over. I'm going to see Barnum again when he comes to town."

MEGATHYMUS YUCCAE RACE NAVAJO SKINNER AT SAN ANTONIO, TEXAS

By H. B. Parks, Texas State Apicultural Laboratory.

The first week in July, 1931, a lot of frass matter was observed among the leaves of *Yucca tenuistyla* Trelease. This plant had been grown from seed at the Apicultural Research Laboratory and as a two year old plant had been set out in a permanent location. July 12th Mr. W. T. Davis, Staten Island, N. Y., and Mr. Geo. P. Engelhardt, Hartsdale, N. Y., visited the Laboratory. Their attention was called to this boring and both of these gentlemen agreed that it was the work of the larvae of *Megathymus* and that it was an insect either at the eastern edge of its range or entirely outside of its range.

It has been the experience of the men at the Laboratory that because of heat and drought it is very hard to rear larvae through to maturity within the building. On account of this a screened cage was constructed and placed over the Yucca. The larvae continued to work and in October commenced to build the tube which is characteristic of this insect. This tube extended about three inches above the place where it entered the Yucca caudex. Occasionally the larvae would get partially out of the tube and coat the outside of the tube with frass matter and cuttings from Yucca leaves.

January and February of 1932 were very warm months with no frosts. A close watch was kept on this insect as it was suspected that it would emerge early, however, no sign of emergence occurred. April 19th the cage was removed and the tube examined. The pupa was in place and alive. The cage was put back into place. The next day it started to rain and this rain continued until the afternoon of April 25th when a severe hailstorm almost destroyed the cage over the Yucca plant. Immediately after the hail had ceased to fall the wreck of the cage was examined and much to the sorrow of those who had watched this plant almost daily since July were grieved to find the very much mutilated body of the newly emerged butterfly almost buried in the sand at the foot of the Yucca plant. Just when it emerged would be impossible to tell but it appears that it must have been early in the week shortly after the rain commenced. The remains, very carefully cleaned from sand, are available for identification. The specimen is a female. The pupa case and silk tube have been preserved. The determination is by Mr. Ernest L. Bell, of Flushing, N. Y.

BOOK NOTES.

Dr. Alexander B. Klots is now head of the Department of Entomology of Ward's Natural Science Establishment (whose advertisement appears on another page) ; their last catalogue gives evidence of an expert hand. This institution, which is now a part of the University of Rochester, is non-commercial in character.

Dr. Klots is author of *Directions for Collecting and Preserving Insects,* which Ward's has lately published. These directions are of necessity quite succinct and will need to be supplemented by more specific ones for particular orders. However, they are without doubt the most modern available, both as to methods and apparatus. The illustrations are very clear and helpful. For anyone wishing to be informed as to the latest practice this booklet is well worth its small cost.

However, I take great exception to the size of the page (8½ x 12). This is an extremely unhandy dimension. This is the judgment of one who has edited professionally for twelve years and who has gone exhaustively into the question of the proper size of a page, not from the point of view of an artistic-minded editor or advertising man, but from the practical one of readers and users of books. The quarto page is associated in many minds with depth of learning—a hang-over from the Renaissance; but we of this day and generation can profitably remember that Lincoln is said to have written one of the greatest of human documents on the back of an envelope, and that this fills but one small printed page.

In a future edition of this useful pamphlet we trust it may be in a smaller format; such as this page, for example.

J. R. T.-B.

N. B.—This is a gratuitous commentary—NOT an advt.

To Our Readers.

Please use very promptly the subscription blank included in this number.

EDITORIAL.

The Past, the Present and the Future.

Briefly, the past of the Bulletin of the Brooklyn Entomological Society has been a period of growth, expansion and improvement. But the past is always behind us, to spur us onward to a finer future through the present.

As with us all, the Bulletin has been confronted with the problem of diminishing returns. To solve this problem there was the choice of two courses—either to increase the subscription price to make up the deficit; or to decrease our size to make our total cost of production come to some degree within our lessened income. The Publication Committee of the Society elected the latter course.

In consequence, this year our subscribers will be receiving only some 260 pages for their subscription price, instead of some 280 as last year.

However, the quality of our articles has not suffered; but those of a more extensive nature have been less numerous.

We trust that our loyal subscribers will continue with us as heretofore and that they will cooperate with us as always.

The Publication Committee.

P. S.—Please use the enclosed subscription blank promptly, sending it to our Treasurer with remittance.

Notice to Subscribers

Title Page and Index to this volume (XXVII) are bound in with this number.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

HISTERIDAE—Desire to obtain material, all localities, for identification, by purchase or exchange of other families. Chas. A. Ballou, Jr., 77 Beekman St., New York, N. Y.

CATOPINAE.—American *Catops, Choleva, Ptomaphagus, Catopomorphus, Prionochaeta, Echinocolus, Dissochoetus* wanted by Dr. René Jeannel, 57 rue Cuvier, Paris 5, France.

LOCALITY LABELS.—60c per 1000, 5 in strip, 1 to 3 lines. Good heavy paper. Prompt service. A. L. Stevens, 691 Culver Rd., Rochester, N. Y.

WILL collect all orders of insects about this locality for those interested. Louise Knobel, Hope, Arkansas.

CARABIDAE.—Will exchange beetles of any family for unidentified Carabidae. Carl Geo. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

I will collect all orders of insects and allied groups for those interested. Louise Knobel, Hope, Ark.

CENTRAL AMERICAN INSECTS in all Orders collected on order. Write to J. J. White, Punta Gorda, British Honduras, C. A.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, University of Rochester, Rochester, N. Y.

COLLECTORS: Will collect material in any order at low rates. Fine location and good knowledge of southern hosts, etc. Also travel to the Keys, etc., for specimens. Accurate data and perfect specimens, write for prices. Everett C. Lerch, Box 55, Fern Park, Florida.

TABLE OF CONTENTS TO VOLUME XXVII.

(Arranged alphabetically throughout.)

Book Notes.

Coleoptera.

Diptera.

GENERAL SUBJECT.

HETEROPTERA.

HYMENOPTERA.

LEPIDOPTERA.

INDEX TO GENERA AND SPECIES OF INSECTS, OTHER ANIMALS, AND PLANTS.

New forms are in **bold face**; valid species and genera in Roman; synonyms in *italics*; * indicates plants; † Long Island Records; ‡ other animals. For full list of all genera and species of the order Protura, see pp. 125–130; for extensive list of Coleoptera added to N. Y. State List of Insects (all Long Island records), see pp. 189–195. Species named in these articles are not in the alphabetical list following.

New Genera in this Index, 0
New Species and other forms in this Index, 30