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THE CORN LEAF-TIER, LEREMA ACCIUS S. & A.*

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The corn leaf-tier, *Lerema accius* S. & A., is one of a large number of corn feeding species of insects which have never been known to cause appreciable damage, but are still a potential pest of this plant and of other economic grasses. It belongs to the *Hesperidae* or skipper butterflies, several of which, in the South are recognized as pests, among them the Bean Leaf Folder *(Eudamus proteus* L.), and the Larger Canna Leaf Roller *(Calpodes ethlius* Cramer).

The original description of the adult was published in a paper on the "Lepidopterous Insects of Georgia" by Smith and Abbott in 1797 under the name of *Papilio accius.* In 1872 Mr. S. H. Scudder erected the genus *Lerema* with this species as the genotype. The most complete account so far published is one by this same author in his "Butterflies of New England" in 1889. The records of the Bureau of Entomology regarding this species are very meager. Mr. R. A. Vickery reported finding a single small larva on corn at Brownsville, Texas, Mr. W. R. McConnell noted it at several points in Mississippi, and Mr. W. H. Larrimer found larvae on two species of grasses at Chickasha, Oklahoma. The above records, a few other scattered observations and a series of rearings at Lakeland, Florida, during the winter and spring of 1913 furnish the material for the following paper.

It is impossible to fix definite limits for the range of this species. It was first described from Georgia, the exact locality not being indicated. An attached note adds that "It is also found in Virginia." Scudder's map of its distribution shows it

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to occur throughout a narrow strip of territory along the Gulf and Atlantic coasts as far north as Massachusetts, and another along the Mississippi River as far north as southern Illinois. It has been found by Mr. Larrimer at Chickasha, Okla., by the writer at Chattanooga and Leadvale, Tenn., and Clemson College, S. C., all outside of the above limits and indicating that its distribution is more general throughout the Southeastern states than Scudder's map leads one to believe. Like several of its close relatives it is probably of tropical origin and habit and if so its northern limit fluctuates from year to year with the severity of the winter and the conditions favoring northward flight during the summer.

The adult butterfly has a wing expanse of about 33 mm. and in color is a dark, warm brown with six more or less rectangular white spots on the fore wing of the female (in the male but four and these much smaller). Three of the six in the female are small and in a close, nearly straight row near the anterior margin about two-thirds out from the base of the wing; two others, of which the posterior is the larger, lie between this group and the hind margin of the wing, and the last at the upper edge of the cell. In different individuals the prominence of these markings varies considerably but their relative size and position are constant. The hind wing is uniform brown above, and beneath both fore and hind wings shade to purple along the distal margins. The butterfly is a strong flier and has the erratic, zig-zag flight characteristics of its family.

The eggs are laid singly and widely scattered, usually on the lower but sometimes on the upper surface of the leaf. Seldom is more than one found on a plant and we have never seen two on the same leaf. They are white with a pearly luster, subhemispherical in shape and about two-thirds as high as wide, with the basal angle rounded, diameter 1.2 mm., height .8 mm. The chorion is finely reticulated. The rounded basal angle serves to distinguish this from the otherwise very similar egg of *Calpodes ethlius* in which the wall joins the base with a sharp right angle.

Since oviposition has never been observed, the exact length of the incubation period is not known. Of eleven eggs taken in the field at various times, seven hatched in nine days, two in six days, and two in five days, indicating that nine days is probably the normal period. A day or two after being laid the

egg takes on a creamy tinge, on the sixth day a faint mottling appears near the apex and on the eighth day the dark head of the young larva can plainly be seen through the shell. The embryo lies coiled around the circumference of the egg with the head a little to one side of the center. The first break in the shell is made by pressure of the mandibles and the larva then proceeds to cut an irregular hole in the apex, rotating within the egg during the process. When the opening is as large as its head the larva emerges. The entire operation occupies some time, one larva which broke the shell at 8:00 A. M. having just released itself at 3:00 P. M. In the meantime the head of this larva changed from chocolate-brown to glistening black. The empty egg-shell is translucent white, waxy and parchment-like in texture except the flat base which is transparent.

After a brief survey of the immediate vicinity the newly hatched larva returns to the egg shell and consumes it, leaving only the disk-like base which it cannot be induced to touch even when it has been loosened from the leaf. This little glistening disk can almost invariably be found somewhere on each infested plant. After breakfasting on the egg-shell the small larva selects a location on the upper surface of the leaf, near the edge and begins to construct its retreat by placing a layer of silk fibers on the surface. The effect of this is quickly seen in the gradual curling of the blade. When a groove has been thus formed the opposite edges are connected by a silk fiber which bridges the concavity. This fiber is added to until it forms a strong strand and its contraction draws the edge over until it touches the surface of the blade, after which other similar attachments are formed at short intervals until a complete tube, open at both ends is formed. In the finished retreat of a full grown larva there are from five to twelve such fastenings. In the instances observed by the writer the fold was always over onto the upper surface of the leaf, but Mr. McConnell has noted that at Greenwood, Miss., larvae feeding on sorghum folded the leaf upward and downward in about equal numbers. The earlier retreats are generally near the tip. Later the edges of a narrow leaf may be drawn together or the margin drawn over to the midrib at any point along the blade. When the roll is complete the larva cuts a deep narrow notch into the leaf at each end and seals the ends. The skill with which the weak and apparently helpless larva manipulates the thick, stiff corn leaf is remarkable.

During the day the larva never leaves its refuge but feeds on the leaf close to the ends of the tube or on the tube itself. At night other parts of the leaf or even other leaves are eaten. When one retreat is outgrown or consumed another is constructed near by. The feeding is spasmodic, sometimes nothing being eaten for two or three days and then in a night almost all of a small plant consumed. When ravenously hungry a larva will cut holes and notches in a leaf without waiting to construct a retreat. The larva at any age seems unable to cling to the naked leaf surface but when moving about always swings its head from side to side laying down silk fibers to which it clings. In this manner it readily climbs a perpendicular glass surface. Excrement is ejected with a snap which sends it to a distance of two or three feet from the plant.

The newly hatched larva is pale yellow with glistening black head and with a single narrow black cervical band separated a short distance from the head and running down on each side to the latero-ventral margin where it ends in a small black dot. The neck-like appearance, caused by a decided constriction of the body just behind the head, is more conspicuous in the later stages as is also the vertical position of the head. The body is provided with scattering minute shining hairs, a pair of which projecting caudad are somewhat larger than the rest. As the larva feeds it assumes a greenish color which, in the second and later instars, is covered with a glaucous, frost-like overcolor. A darker green meso-dorsal line appears and the caudal end of the body becomes flattened and boat-shaped, covering and concealing the caudal pair of legs. A pair of black dots on the third segment from the caudal end becomes more conspicuous with each succeeding molt. The surface of the head becomes granular and sparingly hirsute and under a lens the skin of the body is seen to be covered with minute black bristles.

There are five instars which may be distinguished by the head widths as given below in millimeters:

Instar	Average	Maximum	Minimum
First	0.6249	0.6530	0.6063
Second	0.9001	0.9328	0.7929
Third	1.2599	1.3059	1.2126
Fourth	1.7492	1.8656	1.5858
Fifth	2.3599	2.5186	2.2387

These measurements were taken from a large number of head casts and while there is considerable variation within each in-

(Continued on Page 10)

A NEW AND REMARKABLE FIG MIDGE

By E. P. FELT, State Entomologist, Albany, N. Y.

The remarkable form described below differs from all other gall midges known to us by the forty-one antennal segments in at least one sex, presumably in both, and in addition possesses structural peculiarities which necessitate the erection of a new genus.

Ficiomyia n. g.

The genus runs in our Key to the Chilian Scheueria Kieff, from which it is easily separated by the much greater number of antennal segments, the occurrence of distinct stems on the flagellate antennal segments of both sexes, the absence of marked reticulations in the circumfila and the claws being distinctly longer than the pulvilli. The male genitalia present striking peculiarities, evidenced in part by the subapical insertion of the terminal clasp segment.

Type F. perarticulata n. sp.

Ficiomyia perarticulata n. sp.

The insects were reared from the fruits of *Ficus aurea* by G. F. Moznette of the Federal Bureau of Entomology, stationed at Miami, Fla., and forwarded under date of February 9, 1922. Unfortunately, these specimens were somewhat broken in transit and as a consequence, the descriptions given below are not complete in certain details. The larger reddish females were much more abundant in the sending than the few smaller, yellowish males.

Male:—Length 2 mm. Antennae probably one-fourth longer than the body, sparsely haired, light fuscous yellowish, probably forty-one segments, the fifth with a stem about three-fourths the length of the sub-cylindric basal enlargement, which latter has a length almost twice its diameter, basally a sparse whorl of moderately stout setae, sub-apically a somewhat thicker whorl of long, bent setae; low circumfila occur at the basal third and apically; terminal segments missing; palpi probably uniarticulate; mesonotum fuscous yellowish; scutellum and postscutellum yellowish; abdomen fuscous yellowish; wings hyaline, rather thickly clothed with fuscous scales; sub-costa uniting with the margin at the basal third, the nearly straight third vein at the apex of the wing, the fifth at the basal fourth, its branch at the basal third; halteres pale yellowish; coxae fuscous yellowish; legs mostly dark straw; the distal tarsal segments pale straw; claws long, rather stout, unidentate; the pulvilli about one-half the length of the claws (Unguial characters probably true of all

legs and for both sexes); genitalia, basal clasp segment moderately long, stout, with a spud shaped apical process having a length nearly equal the diameter of the segment; terminal segment sub-apical, moderately stout, slightly curved and with a stout, chitinous spur apically; dorsal plate long, broad, very deeply and triangularly divided, the lobes broadly triangular and thickly clothed apically with long, stout setae; ventral plate long, very deeply and roundly emarginate, the slender, subacute lobes with a length fully six times their width; harpes moderately long, broad, deeply and triangularly emarginate; the lobes broad, and broadly rounded apically; style long, broad, broadly rounded apically.

Female:—Length 2.5 mm. Antennae probably shorter than the body, sparsely haired, fuscous yellowish, forty-one segments, the fifth with a stem one-third the length of the sub-cylindric basal enlargement, which latter has a length one-fourth greater than its diameter, basally a thick whorl of long, stout setae extending to the tip of the segment; low circumfila at the basal third and apically; terminal segment slightly produced, roundly cuboidal and with a length nearly one-half greater than its diameter. Palpi: uniarticulate, the one segment having a length nearly twice its diameter and bearing apically a sparse group of rather long, stout setae; mesonotum dark brown; sub-median lines yellowish; scutellum dark brown; postscutellum yellowish brown; abdomen dark reddish brown; halteres pale yellowish; coxae reddish brown; femora a variable fuscous; tibiae and tarsi dark straw; the ovipositor about one-fourth the length of the abdomen, fuscous yellowish; terminal lobes with a length about three times the width, broadly rounded apically and with a few sparse setae. Other characters probably as in the male.

Type Cecid. A 3228, N. Y. State Museum.

ANOTHER CAMPHOR THRIPS

J. R. WATSON

Karnyia gen. Nov. *(Phloeothripidae, Cryptothripinae).*

Head longer than broad and longer than the prothorax. Wings comparatively weak and short; membrane slightly narrowed in the middle. Tibiae without teeth; tarsi of ♀ armed with a large curved tooth; fore femora thickened in both sexes, without teeth near the apex. Antennae 8-segmented, segments 6 and 7 not united. Ocelli present, widely separated. Labrum sharp-pointed and extending beyond the remainder of the broadly-rounded mouth cone. Bristles of the last abdominal segment long and slender, extending beyond the tube, at least in the ♀. Intermediate antennal, segments little longer than the others. Cheek roughned but without bristles. The new genus differs from *Megalomerothrips* (Watson) in that the intermediate antennal segments are not elongated and the male lacks the long tarsal tooth.

Type K. weigeli.

K. weigeli, n. sp.

♀. Color uniformly dark brown except the fore tibiae and tarsi and antennal segment 3, which are brownish yellow.

Measurements: Total body length 1.4 mm. (1.2 to 1.6). Head, length 0.17, width 0.14 mm.; prothorax, length 0.12, width (including coxae) 0.25 mm.; mesothorax, width 0.23 mm.; abdomen, greatest width 0.28 mm.; tube, length 0.11, width at base 0.056, at apex 0.029 mm.

Antennae: total length 0.29 mm.

Segment	1	2	3	4	5	6	7	8
Length	32	41	47	48	43	36	42	28
Breadth	27.5	27	26	28	22	21	20	12 microns

Head about 1.2 longer than wide and considerably longer than the prothorax, smooth except for a few longtitudinal lines; cheeks slightly arched, slightly converging posteriorly, roughened; post-ocular bristles about as long as the eyes, knobbed, pale, no other prominent bristles on the head. *Eyes* rather small, scarcely a third the length of the head, roughly triangular in outline, dark. *Ocelli* large, yellowish brown, well separated; posterior pair situated opposite the middle of the eyes, close to, but not touching, their margins; bordered by narrow orange crescents. *Mouth cone* reaching .6 the distance across the prosternum. *Antennae* about 1⅔ as long as the head, segment 1 concolorous with the head; 2 lighter brown, urn-shaped with a broad pedicel; 3 yellowish-brown, almost triangular; 4 brown but lighter than 5-8 which are uniformly dark brown, conspicuously the largest segment; 6 conspicuously short and narrow, ovoid; 7 barrel-shaped; 8 conical. Bristles and sense cones pale and inconspicuous.

Prothorax (including coxae) fully twice as wide as long, trapezoidal in outline; posterior angles well rounded, bearing a single pale, knobbed bristle of medium length, a somewhat longer one on each coxa, also knobbed; a minute bristle on each anterior angle.

Mesothorax somewhat narrower than the prothorax, sides converging sharply posteriorly. Metathorax, sides nearly straight and parallel. Wings short, membrane reaching to about the middle of the abdomen, colorless except for a brown area at the base; fringing hairs long but sparse, 2 or 3 interlocated ones. Legs short; fore femora much thickened, with a long bristle and two shorter ones on the inner side; fore tarsus with a curved tooth, which is variable in size.

Abdomen cylindical, segments 2-9 bearing on each posterior angle a knobbed, almost colorless bristle, which become progressively larger posteriorly; segments 7-9 bear in addition from one to three pairs of pointed bristles, two pairs of these on the ninth segment are much longer than the tube, a pair of knobbed bristles nearly or quite as long as the tube arises from the ninth segment adjacent to the base of the tube.

Male. Somewhat larger than the female; prothorax much smaller. General color brownish yellow, head, prothorax, and fore legs yellowish brown, pterothorax and middle and hind legs light brownish yellow with darker spots; abdominal segments 1 and 2 light yellow, 3, 4, 8, and 9 deep yellow, 3 and 4 with brownish anterior margins; 5 light brown, 6 dark brown, 7 yellowish brown, 5 and 6 forming a conspicuous dark band; tube brownish yellow. Fore wings banded with brown in the middle and at the tips; no interlocated hairs. Hind wings shaded with brown but not banded. Fore femora enlarged but much smaller than those of the female. Terminal bristles of the abdomen and of the tube much shorter than in the female. Labrum shorter, barely exceeding the remainder of the mouth cone. No tarsal teeth.

Described from two females and a male collected by Mr. C. A. Weigel at New Orleans, La., February, '22, from camphor infested with camphor scale *(Pseudaonidia duplex)*, and a single female and larva collected from camphor at New Orleans by Mr. W. W. Yothers, June 24, 1921. Type in the author's collection.

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A CORRECTION. Thru an oversight the last number of the ENTOMOLOGIST was marked No. 3 of Vol. V instead of No. 4.

MOSQUITO CONTROL IN FLORIDA

A very valuable bulletin has just been published by the Florida State Board of Health. It is entitled "Mosquitoes and Mosquito Control," by Geo. W. Simons and Geo. F. Mosnette.

In a recent publication of the Russell Sage Foundation, "Survey of Florida County Jails," by B. C. Riley of the General Extension Division, University of Florida, the statement is made that "only half the jails have any screens." This is indeed a deplorable and dangerous condition of affairs. Not only is an unscreened jail a cruel injustice to the prisoners but also a constant menace to the health of the community in which it is situated. It could easily serve as a center of infection from which malaria might spread over the town.

MEETINGS OF THE FLORIDA ENTOMOLOGICAL SOCIETY

March 27. The Society met with the Horticultural Seminar in the office of the Nursery Inspector, Pres. Floyd of the Seminar in the chair. Members present: Berger, Burger, Floyd, Lord, Montgomery, Stone and Watson. Prof. Watson read a paper on the "Correlation Between Sunspot Maxima and Florida Freezes." This was followed by a general discussion. Dr. Burger discussed Current Notes on Plant Pathology with a review of Smith's "Bacterial Diseases of Plants." Mr. Goodwin was elected Business Manager of the ENTOMOLOGIST in the place of Dr. E. W. Berger, resigned. O. T. STONE, Sec'y Pro. Tem.

April 24. The Society met in the Plant Board offices with Pres. Stirling in the chair. Members present: Berger, Beyer, Brown, Lord, Merrill, Montgomery, Newell, O'Byrne, Stirling, Watson. Mr. Brown gave an illustrated paper on "Protecting Florida's Horticulture."

May 22. The Society met with the Horticultural Seminar, Dr. E. W. Berger in the chair. Major W. L. Floyd, Prof. of Horticulture in the University; Reginald Hart of the Plant Board, stationed at Ft. Lauderdale; Mr. Ed. L. Ayers, and Prof. J. S. Rogers were elected to membership in the Society. Mr. A. H. Beyer was elected Business Manager of the ENTOMOLOGIST. Mr. Ayers gave the paper of the evening on Bordeaux Mixture. He discussed the proper method of making the mixture and the causes of burning.

PERSONALS

R. N. Van Zwaluwenburg, entomologist of the United Sugar Companies, Los Mochis, Sinaloa, Mexico, was visiting Mr. Merrill, May 28. He was on his way to Cuba to collect parasites of the Sugar Cane Moth Borers.

The position of Extension Entomologist and Pathologist of the Agricultural Extension Division has been filled by the appointment of Mr. Ed. L. Ayers of Texas. Mr. Ayers has had much experience in Texas as Nursery Inspector and with commercial horticultural firms.

Prof. J. S. Rogers, head of the Department of Biology in the University, has left for Michigan on his summer vacation.

Mr. O. T. Stone of the Nursery Inspection Office has moved into his new house on West Union street.

ANOTHER APHID FROM GAINESVILLE

In connection with the host plant list of Gainesville aphids by Mr. Mason, published in our last issue, Mr. Geo. G. Ainslie calls our attention to *Carolinaia cyperi* Ainslie, the original description of which was published in the Canadian Entomologist March, 1915. This was collected from nut grass at Gainesville by Mr. Ainslie and is probably the species Mr. Mason records on page 23 as *Carolinaia sp.*

A LADY-BEETLE NEW TO FLORIDA

Mr. Geo. F. Merrill adds to the list of Florida Coleoptera the white lady-beetle *Olla abdominalis* Say. It was sent in from Tampa. Its range has hitherto been given as Indiana to Texas and west.

THE CORN LEAF-TIER, LEREMA ACCIUS S. & A.

(Continued from Page 4)

star, they do not overlap. In the first two instars the head is black, in the last two it is strikingly banded with white in the form of a narrow white band completely encircling the face on the margin and an inverted white V on each side of the face. In the last instar the vertex becomes reddish-brown. The third instar, however, presents both black heads and those striped with white as described for the fourth and fifth. This variation may be due to sex though this was not proven. Two larvae taken near together and having exactly the same head widths showed this difference.

As the larva prepares to molt the new head is formed within the body just caudad of the old one and shortly before the skin breaks there appear to be two distinct heads, even the markings of the new one showing through the epidermis. All the head casts are discarded unbroken except the last one which ruptures along the frontal suture. The pellicles of all except the last molt are very delicate and difficult to find. The larva is pale gray when freshly molted.

A day or two before pupation the larva becomes covered with a distinct while pulverulence. We have observed its first appearance as much as four days before pupation as two powdery white areas on the ventro-lateral margin of the body just caudad of the caudal pair of legs. From this point it spreads until the whole body is covered. It is all carried away with the last exuvium which remains attached to the head cast and is much more bulky than any of the preceding.

Twenty larvae were reared, nine of them completely through from egg to adult. The following table shows in days the length of the different instars and the total larval life.

No. of Larva	First instar	Second instar	Third instar	Fourth instar	Fifth instar	Total larval	Pupa stage	Probable egg	Total
*1							32		
*2					21		21		
*3							27		
4	7	5	8	17	10	47	16	9	72
5		6	12	13	13		13		
6	9	10	———	26	———	45	13	9	67
7							16		
8	———	———	45	———	———	45	12	9	66
9			9	6	24		16		
10	9	8	12	—14—		43	13	9	65
11	11	—23—		—13—		47	14	9	70
12	7	—22—		—16—		45	13	9	67
13	—14—		—17—		5	36	16	9	61
14	8	8	———	23	———	39	13	9	61
15			12	8			15		
16	8	13	———	13	———	34	12	9	55
17		8	7	— 9—			14		
18			5	—11—			16		
19		8	4	—10—			11		
20		———	25	———			14		
Average	8.4	8.2	8.6	12	13	42.3	14	9	65

*These larvae were taken in Florida in November, 1912, and reared indoors at Nashville, Tennessee. They are not included in the averages.

When fully grown the larva covers a portion of the surface of a leaf with silk, suspends itself with a girdle about the thorax and pupates in a fold of the leaf, head downward in most cases. The larval skin breaks along the dorsal line from the head to about the second abdominal segment and is worked back by the pupa to its caudal extremity. The pupa is clear translucent green, 27 mm., long and 5 mm. wide. The anterior end is drawn out into a conical process 3 mm. long. The tongue lies in a straight slender case along the ventral side. Four or five days before emergence the wing pads and thorax assume an opaque whitish color, the eyes begin to darken and finally become deep

purple. The body retains its pale color until a few hours before emergence when it rapidly darkens from the head caudad. The pupal case remains as a crumpled dingy-white skin attached to the leaf. The duration of the pupal stage is shown in the table on page 11. An individual reared at Brownsville, Texas, by Mr. R. A. Vickery remained 11 days in the pupa and Mr. W. R. McConnell noted seven at Greenwood, Mississippi, which emerged in from seven to thirteen days. The maximum reached under out-of-door conditions in Florida was 16 days and the lengthened pupal period of the individuals reared at temperatures greatly below normal at Nashville indicates some power of adaptation to unfavorable conditions in this stage.

The writer has not had the opportunity to follow this species throughout an entire year in the field and all the data at hand concerning its seasonal history are fragmentary. February 11 a first instar larva was found at Brownsville, Texas. June 3 a nearly full grown larva and June 17 a pupa were taken at Greenwood, Mississippi. As early as June 1 a larva nearly full grown, was found at Marion, South Carolina, and September 16 full grown larvae and pupae were found at Clemson College, in the same state, on corn growing in an open greenhouse used as an insectary and at the same place on September 25 on upland rice growing in the open. At Orlando, Florida, larvae survived the mild winter of 1912-13 which was unusually warm even for Florida, there being insufficient frost to injure corn growing in the open. Mr. McConnell attempted without success to carry larvae and pupae through the winter at Greenwood, Mississippi, where they were exposed to freezing, but not severe, temperatures. The great susceptibility to frost of the similar and closely related species, *Calpodes ethlius*, and the probable tropical origin of this species lead to the conclusion that it cannot survive severe freezing weather. If such be the case the butterflies must travel for long distances and very rapidly to reach so early in the summer the localities mentioned above. The larvae in the table on page 11 are arranged in approximate chronological order from November, 1912 to June, 1913, and the figures indicate that the time required for development becomes less as the season advances. At none of the points where this species has been noted do the records indicate any distinct generations, furnishing further support to the theory of its tropical origin; for definite seasonal habits with long

quiescent periods, little or not at all affected by outside influences, are evidence of a long course of adjustment to conditions as found in the temperate zone.

In the spring of 1913 the generations were not distinct, for eggs and larvae of all sizes were found at the same time. The time required for the development of a generation, 65 days not including the time required for mating and oviposition after emergence, indicates that there may be several generations in Florida in one year, and at least two as far north as the species is likely to go. It is probable that it is a continuous breeder in its permanent range and that it travels northward every summer and is killed back every winter as is the case with several others of our economically important insects. However, the fact that *Calpodes ethlius* has reached and caused damage at Washington, D. C., may indicate similar possibilities for this species.

The original account gave American wisteria *(Bradleya frutescens* (L.) Britton) as the food plant but a note adds that it "is most commonly to be met with in the chrysalis state on the blades of Indian corn, *Zea mays,* in which it enfolds itself." Chapman found larvae in the leaves of *Erianthus alopecuroides* (L.) Ell. at Apalachicola, Florida. McConnell found several larvae feeding on sorghum at Greenwood, Mississippi, and one on a grass locally known as "tumble grass," probably *Panicum capillare,* at Memphis, Tennessee. The writer found larvae feeding in leaves of upland rice on the grounds of the South Carolina Experiment Station at Clemson College and a single one in a rolled leaf of Johnson grass *(Sorghum halepense)* at the Florida Experiment Station at Gainesville. All other records give corn as the food plant. Further observations are required to determine the possible food plants but, among cultivated crops, corn will probably head the list.

Three species of parasites have been reared, one from eggs and two from larvae.

Xenufens ruskini Gir. Of eleven eggs taken on corn leaves at Orlando, January 28, two were mottled and darker than the rest. On February 10 they had become very dark and on the 20th 12 minute hymenopterons emerged from one egg, and on the 25th, 10 from the other. They left through a small hole in

the apex. The empty shell retained its mottled appearance. Another egg in the same lot appeared normal until February 4 when the shell showed faint mottling which slowly increased until 12 adult parasites emerged on March 10, 42 days after the egg was collected. Eggs of *Calpodes ethlius* occurring in large numbers on canna leaves at Orlando on February 17 were found to be almost 100% parasitized and though most of the parasites had emerged, enough were obtained from the several dozen eggs collected to determine them as the same species attacking the eggs of *Lerema accius*. The parasite was described by Girault* from specimens reared from eggs of *Eudamus proteus* taken in the same vicinity and at the same time it was found attacking the eggs of *Lerema accius*.

Microdus sp. A small dwarfed larva of *Lerema*, taken in the field at Lakeland, April 10, gave forth on the 15th a hymenopterous grub which, after spinning a few threads, pupated in a corner of the box in which its host had been confined. The pupa was 8 mm. long, naked, white except for the eyes and ocelli which darkened as development proceeded. On the 24th the thorax turned yellow, and the adult emerged on the 26th. The adult, which proved to be a female, had a reddish-brown head and thorax, yellow abdomen and black wings.

Euplectrus insuetus Gahan. An undersized yellowish larva taken in the field at Lakeland, April 10 almost at once gave forth 16 white grubs which moved a few millimeters from the dead body of their host and transformed to naked pupae attached to the bottom of the box with their ventral sides uppermost. On the 23rd the adults, small Chalcids, emerged. They are black except for the dark eyes and the legs and cephalic half of the abdomen which are pale yellow. From this material the species was described by Mr. A. B. Gahan† as new.

Investigations during the more entomologically active part of the year would undoubtedly reveal more parasites concerned in the control of this species and it seems likely that the ordinary scarcity of the larvae may be attributed to parasitic agency.

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*Ent. News, Vol. 27, p. 6.
†Proc. U. S. N. M. Vol. 48, p. 164.

CONSIDER THE FLY

The tops of the maples are red with buds; the warm forest glades are dotted with violets and white forget-me-notes *(Houstonias);* an occasional sedge, and in the more sunny spots the Sheep Sorrell *(Oxalis),* are in bloom; and in the deeper shade the Twin Flower. It is early spring. (January 15.)

And as we rest here in this sunny glade in the forest Muscus domesticus comes to keep us company. In our towns we call him the "Typhoid Fly" and hire sanitary officers to deal with him, to wage unceasing war against his young. In our dwellings we call him the "House Fly." We screen against him. We trap him. We poison him. We swat him. But here in the woods he is a harmless, sociable fellow—and so hardy!—the first insect to crawl out on a cold morning, a real harbinger of spring. He does not bite like his cousin the Stable Fly. And why blame him for carrying our filth about? It is we who furnish him with his germs. Like too many of us humans he has been spoiled by too much "civilization." Clean up our towns and barns and he would cease to be a menace. Would he cease to exist? Probably not, for I read that on some barren South Pacific island, where the only vertebrate animal to furnish him manure is a species of rat, he is present in abundance. Verily he is a hardy rascal.

THREE SCALES NEW TO FLORIDA

Mr. Geo. Merrill has recently added to the list of the scale insects of Florida three species, as follows:

Gymnaspis aechmeae Newst. was collected from Bromeliaceae at Little River by Mr. Jeff Chaffin. It has also been taken at Gotha.

Targionia sacchari (Ckll.) was taken from sugar cane at Miami by Mr. E. L. Kelly.

Lepidosaphes camelliae Hoke—Camellia Scale. On Camellia Japonica. From Oneco to Tallahassee, Alabama, Georgia and Mississippi.

WHAT'S IN A NAME? SOMETIMES CONSIDERABLE

A recent correspondent expresses himself as follows concerning the new fumigant for borers in peach trees: Paradichlorobenzene.

"Say, why couldn't the inventor have simply named the stuff 'borer assassinator'; or, if he had to have a long name for it, called it "Sickhimandgoinyourlengthandgethim benzene'? And then we laymen could analyze the name."—C. A. Finley.

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NEW SPECIES OF CICADELLIDAE FROM THE SOUTHERN U. S. (Homoptera)

HERBERT OSBORN

Deltocephalus limicolus, n. sp.

Dark gray with fuscous markings; numerous reticulate lines and cross nervures on the eytra. Length, female 3.75 mm; male 3.6 mm.

Head wider than pronotum; vertex wider than long, one-half longer at middle than next the eye, obtusely angulate; margin subangulate to front; front broad, lateral borders curved; clypeus with sides nearly parallel; cheeks broad and deeply sinuate. Pronotum as long as vertex, truncate behind; scutellum small; elytral venation irregular, the clavus with numerous irregular reticulations, and the anteapical cells broken by irregular cross veinlets.

Color: Gray; vertex ivory whitish with four dots on the anterior border, two lunate spots midway and two rounded ocellate spots on the hind border, fuscous. Pronotum fuscous with five gray stripes, the inner three connected by cross-band near the front; scutellum with ivory spots each side; elytral veins and veinlets mostly ivory white, the areoles mostly fuscous, the first apical areole densely black, the others with whitish centers bordered with smoky; front pale fuscous with transverse whitish arcs and a central whitish line; clypeus dull white with smoky borders; lorae light yellow, with dusky margin; cheeks dull gray, legs fuscous, banded and striped with dull white; abdomen beneath blackish, the borders of segments and the outer part of pygofer lighter.

Genitalia: Female, last ventral segment short; hind border truncate or slightly concave; pale whitish, bordered with fuscous; side plates conspicuous. Male, valve short, transverse, broadly rounded behind; plates broad at base, narrowing rapidly, terminating in acute thin slightly upturned tips not attaining the tip of the pygofer.

Numerous specimens were collected at St. Petersburg, Fla., February and March, 1921, on a creeping succulent plant growing in a tidal flat and associated with fiddler crabs and snails. Type and paratypes in author's collection. Superficially this species bears some resemblance to *arundineus*, but the details of the color pattern are different, the body is more robust, and there are distinct differences in the genitalia.

Deltocephalus fusconotatus, n. sp.

Ivory whitish with numerous fuscous spots on pronotum, scutellum and base of elytra. Length, male 3.5 mm.

Head slightly wider than pronotum; vertex as long as width between the eyes, one-half longer at middle than at eye, margin acute toward the apex; front narrow, tapering gradually to base of clypeus; clypeus long, nearly twice as long as wide, sides nearly parallel; lorae short, distant from border of cheek; cheeks broad, distinctly sinuate beneath the eye. Pronotum as long as vertex; scutellum acuminate at tip; claval veins merging near base, middle anteapical cell divided by merging of veins.

Color: Light gray or ivory white; vertex bordered anteriorly with black, except at extreme tip; the outer part of the black line enclosing the ocellus. Pronotum with three somewhat diffuse spots, scutellum with two dots on the base, elytra with a basal dot and a dot before and back of the merged veins, a costal spot near the base, another before the nodal vein and the apical cells, fuscous or blackish; face with base of front densely black, the remainder of front with clypeus, lorae and lower part of cheek, white; a large squarish spot below the eye, reaching antennal pit, black; thorax and abdomen white with a black dot on the pleural pieces, a black band at apex of femora, and black dots on the hind tibiae, and black rings on the hind tarsi.

Genitalia: Male, valve narrow, rounded behind; plates small triangular, about one-half the length of pygofer.

Described from a single specimen, collected at "Cameron, La., Aug. 14-28, 1903", by Prof. J. S. Hine.

This is a handsome little species, somewhat resembling *arundineus*, but differing so much in the color pattern, especially on the face, that it seems impossible to refer it to that species. There is also a distinct difference in the male genitalia.

Lonatura notata, n. sp.

Pale straw color, with numerous black dots on pronotum, elytra and abdomen. Length, female 4 mm; male 3.5 to 3.75 mm.

Head slightly wider than pronotum, distinctly produced, subconical; vertex somewhat flattened, but convex, as long as width between the eyes, nearly twice longer at the middle than next the eye; front narrowing rather abruptly to clypeus; clypeus broad, about one-half longer than width at base, scarcely widened at the middle; lorae elongate, the tips distant from border of the cheek; cheeks narrow, the margin sinuate beneath the eye. Pronotum about three-fourths as long as vertex, hind border slightly concave; scutellum small, short; elytra scarcely reaching base of abdomen, hind border truncate, leaving entire upper surface of abdomen exposed.

Color: Light straw; vertex with three pairs of faintly fuscous spots; two dots on the anterior border, a larger spot at the lateral border, two dots at base of scutellum, a large dot on clavus, a similar one at middle of hind border of elytra, and eight series of dots on the abdominal segments, a dot on anterior femora, a line on the hind femora, dots on the hind tibiae and tarsal claws dark fuscous or black.

Genitalia: Female, last ventral segment short, concave behind, with a central broad tooth notched at the apex; ovipositor scarcely exceeding the pygofer. Male, valve short, rounded behind; plates small, triangular, acute at tip, reaching half way to end of pygofer.

Described from specimens collected at St. Petersburg, Fla., March 5, 1921. Type and paratypes in author's collection. I have also taken speci-

mens at Ocean Springs and Pascagoula, Mississippi, during February, 1921.

The species occurs in the flat-woods association on native grass, and is probably a grass feeder. Numerous black dots on the upper surface seem to be a distinctive character. Only short-winged forms have been noted, so that the venation of long-winged forms, if they occur, has not been seen.

Euscelis (Athysanus) **fumidus** n. sp.

Somewhat like *magnus* but much darker, smoky black, the entire surface appearing suffused with a deep brown-black color. Length, male 6.25 mm.

Head wider than pronotum, vertex short, scarcely longer on middle than next the eye, very obtusely rounded to front, front broad, subangulate at antennae, narrowed abruptly to clypeus; clypeus nearly twice as long as wide, cheek broadly rounded below the eye. Pronotum distinctly transversely striate. Posterior border shallowly concave.

Color: Dark fuscous with small obscure yellowish irrorations; vertex lighter, yellowish with fuscous irrorations; front lighter above, darker below with obscure pale arcs; clypeus nearly black; lorae and cheeks blackish smoky, the whole irrorate with minute yellowish dots. Pronotum scutellum and elytra blackish with minute yellowish dots. Legs blackish with spines somewhat lighter, venter blackish with a central row of light dots.

Genitalia: Male valve small, short, obtusely angulate behind; plates small elongate triangular, tips acute, black, with a row of lighter bristles on the margin.

One specimen, male (type) of this peculiar species from Chester, Ga. This has the appearance of a *Phlepsius* and might be considered as related to *P. latifrons* but it is evidently congeneric with *magnus*. It is distinctly different from this species in the absence of the white band on the pronotum and the white costa, as well as in the intense pitchy black color. If an extreme form of *magnus* it will have to be recognized as a distinct variety.

Euscelis (Athysanus) **drakei**, n. sp.

Related to *magnus* and *fumidus* with a yellowish band behind the middle of pronotum and four milky spots on elytra. Length 6.25 mm, 6 mm.

Head wider than pronotum. Vertex very short, margins parallel; disc convex rounded to the front; front convex except slight depression at base, front about as broad as long, suture below ocellus distant from eye, obtusely angled at eye; clypeus tip scarcely wider than base; lorae rather broad, not reaching margin of cheek; cheek broad, sinuate below eye; pronotum broad; anterior margin broadly arcuate, hind margin slightly concave, lateral margin flaring and sharply carinate. Elytra densely reticulate, somewhat rugose, scarcely exceeding tip of abdomen.

Color: Smoky brown to fuscous. Vertex tawny with minute fulvous dots; upper portion of face like vertex; front below minutely dotted with tawny; arcs faintly indicated; cheeks darker on the margins. Pronotum dark brown to fuscous; posterior border somewhat darker, with a broad yellowish band behind the middle, the whole minutely sprinkled with tawny dots. Scutellum tawny with yellow dots. Elytra smoky, minutely dotted with fuscous; two white patches on the middle of clavus and two on the inner anteapical cell, the anterior just below claval spot.

Genitalia: Female, last ventral segment scarcely longer than penultimate; posterior border sinuous, the middle third and lateral lobes produced; minutely notched on middlle, lateral lobes rounded.

Described from two spemines, females, (type and paratype) collected at Gainesville, Fla., by C. J. Drake. Type in Osborn collection, Ohio State University.

This species is very close to *magnus* O. & B. but aside from the conspicuous transverse spots on the elytra, the costa is not white and the female segment differs in form.

Euscelis (Athysanus) magnus var piceus, n. var.

Similar to *magnus* of typical form but with the coloration, except for the white band on the pronotum and the costal border, of a deep pitchy black and the female sgment with median notch much smaller. Collected by Mr. H. L. Dozier at Pascagoula, Miss., Aug. 8, 1921.

Mesamia nervosus, n. sp.

Light yellow; vertex with an interrupted submarginal black border; elytra with fuscous veins; five or more conspicuous cross veinlets in the outer costal area. Length, female 4 mm.; male 3.5 mm.

Head slightly wider than pronotum; vertex nearly twice as wide as long, rounded in front, about one-fourth longer at middle than next the eye, distinctly angular to front; front narrowing nearly uniformly to base of clypeus; clypeus narrow, nearly twice as wide as long, slightly widened toward the tip; lorae rather narrow, with tip nearly reaching to the margin of the cheek; cheek slightly sinuate below the eye. Pronotum two-thirds longer than vertex, slightly concave behind; elytra with cross veinlets in outer claval and costal cells; two cross veins.

Color: Vertex, pronotum and scutellum yellow tinged with green, vertex with a conspicuous submarginal band interrupted at the middle behind which is a fainter fuscous band in the female, scarcely apparent in the male; disc of pronotum darker; elytra hyaline, the veins conspicuously dark fuscous or black, the cross veinlets of costa widening on the margin; apical broadly blackish; beneath, face yellowish-green, a narrow black line bordering the base of front; abdomen greenish, the segments above with black spots or bands.

Genitalia: Female, last ventral segment about twice as long as preceding; apex broadly rounded with a faint notch at middle; male, valve short, rounded behind; plates triangular with acute upturned tips; the disc marked with a distinct impression paralleling the outer border.

Described from a female, (type) Sept. 27, 1921; and male, (allotype) Sept. 9, 1921, collected by Mr. F. E. Guyton, Auburn, Alabama.

Also one female, (paratype), from Keatchie, La., June 14, 1905. This latter differs from the type in having a less distinct second band on the vertex, a more distinct yellow color to the pronotum, but otherwise is so similar that it seems impossible to consider it a distinct species.

These specimens approach most nearly to *Mesamia stramineus,* Osb., but have a different shaped vertex and much more distinct venation.

ADDITIONS TO THE THYSANOPTERA OF FLORIDA. X

J. R. WATSON

54. **Megalomerothrips eupatorii** Watson.

Male. The female only of this species was originally described. (Fla. Buggist, Vol. II, No. 3, Feb. 1919). We now have the male also. Much darker in color than the female, almost jet black. Fore tarsus with a very large, slightly curved spine, 27 interlocated bristles on the fore wing. Taken from the burrow of a cerambycid in a dead twig of avocado, Winter Haven, Oct., 1921. An additional female was collected by Dr. E. W. Berger in one of his colonies of cottony cushion scale. It may be predaceous.

57. **Dictyothrips floridensis** Watson.

Male. Considerably lighter in color than the female. Light brown with traces of bright red hypodermal pigment. Abdomen very slender, darker than the thorax. In the integument on the dorsal side of segments 2-7 are numerous large pellucid dots which occupy about ¼ the surface. These peculiar dots seem to be entirely absent from the females.

Larvae light yellowish brown with much red hypodermal pigment.

Described from several males and larvae.

In addition to the type locality in the Plant Introduction garden at Miami, this species has been collected in the Plant Introduction Garden at Brooksville by W. B. Wood and H. L. Sanford of the U. S. Horticultural Board. In addition to the original host, Guava, it was taken on *Passiflora sp., Rubus sp., Arracacia xanthorihisa,* and *Prunus sp.* Since it has been found only in the Plant Introduction gardens and its nearest relative is a native of Mexico, it would seem quite probable that this is an introduced species.

74. **Heliothrips phaceoli** Hood.

Abundant on Kudzu on the Station grounds, Gainesville, June, 1921.

75. **Haplothrips gowdeyi** Hood.

In Bidens blossoms, Ft. Myers, March, 1922. Hitherto known only from the West Indies.

76. **Haplothrips humilis** Hood.

On compositae. Ft. Myers, March, 1921. Another southern species not hitherto found in the United States.

77. **Haplothrips merrilli** Watson.

This species, described from specimens taken from cocoanuts from Cuba, (Fla. Entomologist, Vol. IV, No. 1), was found by the writer under the cap scales of cocoanuts at Ft. Myers, March, 1922.

78. **Idolothrips tuberculatus** Hood.

A male of this species was beaten from basswood *(Tilia americana)* at Gainesville, April 14, 1922.

(Mr. H. L. Dozier has specimens of Idolothrips armatus collected at Prairie, Miss., June 17, 1921, and Batesburg, S. C. It is quite probable that this species also occurs in Florida.)

79. **Zygothrips floridensis** n. sp.

Color: Light yellowish brown with much purple hypodermal pigment.

Measurements: Total body length 1.2 mm.; head, length 0.20, width 0.15 mm.; prothorax, length 0.11, width 0.21 mm.; metathorax, width 0.24 mm.; abdomen, width 0.21 mm.; tube, length 0.10, width at base 0.06,

at apex 0.027 mm. Antennae: Segment 1, 24; 2, 44; 3, 67; 4, 56; 5, 46; 6, 40; 7, 44; 8, 27 microns; total length 0.36 mm.

Head: 1.3 longer than wide, vertex rounded, striate towards the posterior margin; frons elevated; head widest just above the base; cheeks slightly convex, bearing a few short hairs; postocular bristles short, reaching but little past the posterior margins of the eyes. *Eyes* rather large, slightly protruding; red by reflected light, black by transmitted; non-pilose; facets large. *Ocelli* large, yellow, bordered with dark crescents; situated on the elevated frons, the anterior directed forward, the posterior pair widely separated, opposite the anterior third of the eyes from whose margins they are well separated. *Mouth-cone* short, reaching about half way across the prosternum; rounded at the tip. *Antennae* 1.8 times as long as the head; dark brown except most of segment 3, basal half of 4, and the extreme base of 5 which are a lighter, yellowish brown, segment 3 long and narrow. All bristles very small. Sense cones somewhat larger but colorless and inconspicuous.

Prothorax little more than half the length of the head, nearly twice as wide as long; trapezoidal; a prominent bristle on each posterior angle. These bristles have pale, dilated tips, all others are sharp pointed.

Pterothorax with sides nearly parallel; upper surface striated. Wings moderately long; membrane quite markedly constricted above the middle, colorless except for a trace of brown at the extreme base of the primaries, fringed with comparatively few and short hairs, four interlocated ones on the primaries. Legs rather long and slender, concolorous with the body except the fore tibiae which are paler, fore femora not swollen, no spines on the basal segments of the tarsi; hind tibiae each with a very thick, heavy bristle near the end.

Abdomen rather long and slender, anterior segments with three or four prominent bristles on each side, the median one or two sigmoid; on the posterior segments these become curved but not sigmoid; a pair on the ninth segment considerably longer than the tube. Tube rather wide for its length; terminal bristles much longer than the tube. Male not seen. Described from a single female taken by Mr. Geo. B. Merrill from an unknown shrub collected at Elfers by Mr. C. P. Sheffield, March, 1922. Type in the author's collection.

80. Hindsiana cocois Watson.

This insect was recently (Fla. Entomologist, Vol. V, No. 4, April, 1922) described from specimens collected from cocoanuts from Cuba taken from quarantine at Key West. Mr. Mosnette has sent us five larvae taken from under scales of cocoanuts at Miami, and Mr. George B. Merrill has collected a half dozen specimens from a mango from Oneco, Fla. As in the case of the other specimens, they were associated with scale insects. The insect is probably predaceous.

81. Cryptothrips laureli Mason (Ent. News Vol. XXXIII, No. 7).

The Bay Thrips. On all species of the genus *Tamala* in Central Florida from Frost Proof to Daytona. It probably occurs throughout Northern Florida but seems to be absent from the bays on the lower East Coast. Closely related to the Camphor thrips with which it was long confused.

36. **Symphothrips punctatus** Hood and Williams.

Oneco, Fla., July, 1922, on mango infested with scales and Septobasidium, George B. Merrill, Coll. This species has been taken at Key West from under the cap scales of cocoanuts from Cuba. Originally described from Orlando.

82. **Hoplanddrothrips funnebris** Hood.

"Fla." Hood '17, P. 63.

83. **Hindsiana cocois** Watson.

Orginally described from Cuba (Fla. Entomoligst, Vol. 5, No. 4, April, 1922, P. 66). Collected from mango, Oneco, Fla., by Mr. Jno. W. Collins.

THE GREENHOUSE THRIPS OUT-OF-DOORS IN NORTH-EASTERN GEORGIA

In August and early September the editor spent a fifteen days' vacation in Rabun County, Georgia, mostly collecting thrips. The most surprising capture was that of *Heliothrips haemorrhoidalis,* the green house thrips, from a wild shrub growing along a stream near Clayton. With the exception of the southern end of Florida (about Miami) this insect, in the United States, has never before been taken outside of greenhouses or in the immediate vicinity of greenhouses during the summer. But there are no greenhouses within many miles of Clayton and no houses very near the place of capture. The place and circumstances of its capture leave no doubt that it is living out of doors there the year around and point strongly to it being a native of the region.

Rabun county is in the northeastern corner of Georgia and this thrips was collected within seven miles of the North Carolina line and at an altitude of about 2000 feet. The vegetation and doubtless the climate of Rabun county is comparable to that of Southern Ohio. If this thrips can live out of doors in Rabun county, Georgia, it should, as far as cold is concerned, be able to do so over a large portion of the United States.

It is, of course, more common in the tropics, and it is supposed to have been introduced into northern greenhouses on plants brought from the tropics. Evidently its native range extends much further north than we have hitherto suspected and, perhaps, instead of being imported from the tropics, it originally entered the greenhouses from some local wild host.

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ENTOMOLOGY AT THE AGENTS' MEETING

The eleventh annual conference of the county demonstration agents was held at the University from September 7 to 14. There were four scheduled talks on entomological subjects and much discussion during committee meetings, laboratory and informal conferences.

Mr. W. W. Yothers outlined the life history of the rust mite. At least 90% of them complete their life cycle, from egg to egg in nine days. Exposure to sulphur kills them in fifteen seconds.

A very live topic was that of dusting citrus trees for the control of rust mite. Mr. DeBusk spoke of the results of some dusting done in his county in cooperation with the Experiment Station. The control on the dusted plots was as good as on the sprayed plots and the cost was only about one fourth that of spraying. Mr. Kime thought it might be necessary to dust two or three times to secure as good a control as with spraying. Other agents spoke of the satisfactory results of dusting in their counties. Of even more importance than the cheapness of dusting as compared with spraying is the rapidity of the operation. In large groves, even tho spraying may be started at the first sign of danger, much damage may be done before the entire grove can be covered. Another point which might have been mentioned is that of safety. Much fruit was burned last year as a result of spraying during hot weather. Mr. Yothers reported as good results from the use of straight flowers of sulphur as with the mixture of sulphur and lime.

Mr. Yothers spoke of the work done at his laboratory on the entomogenous fungi by Dr. Spear. He came to the conclusion that the Red Aschersonia was spread mostly by the whitefly crawlers. This points strongly to the conclusion that the best

time to apply the fungus is when the maximum number of crawlers are out, i. e. about a week after the culmination of the June flight of adults. The yellow aschersonia, however, should accordingly, be applied about the middle of July. The same principle applies to the scale-infesting fungi. They should be sprayed on the trees when the maximum number of scale crawlers are out.

Mr. A. C. Brown spoke on sweet-potato certification.

The committee on truck crops reported the control of aphids to be one of their most serious problems.

RELATION OF ENVIRONMENTAL FACTORS TO WING DEVELOPMENT IN APHIDS[1]

By ARTHUR C. MASON

The generally accepted theory of most entomologists and experimenters on the subject is that winged forms of aphids are produced only when the continued existence of the apterous forms, under conditions then existing, might prove disastrous to the species. This occurs always in the fall in cold climates when sexual forms are produced, the males of which are usually winged, and also at any migrating season in the case of those species which live on two or more different host plants. There are also many other causes attributed to these adaptive variations. Among the factors which may be potent in acting as effective stimuli for wing formation are crowding on the host and hence lessening of the food supply, unusually high or low humidity, early lowering of temperature in autumn, changing constitution of the sap of the plants by chemical means, etc.

In collecting aphids it was noted that usually both winged and apterous forms occurred in the same colony; also, in the life history work with *Myzus persicae*, that some of them would be winged and others apterous. In several cases plant lice which were apterous when collected would develop wings when kept in the laboratory for a day or two. The question often arose as to why some of these forms were winged and some apterous when living under the same conditions, and as to whether the environment of the aphids in the breeding jars had an effect on this. Hence a series of experiments was planned to prove or disprove some of these theories.

[1]A synopsis of Part III of thesis entitled "Systematic and Biological Studies of Some Florida Aphididae", presented by the writer in 1915 to the University of Florida for the degree of Master of Science. This is the third and concluding paper of the series.

Species Used. For carrying on these experiments the following three species of aphids were mostly used: *Lachnus pini* L., *Myzus persicae* Sulz., and *Aphis gossypii* Glov. These aphids could be found in greater or less abundance at all times of the year and both winged and apterous forms occurred naturally in the colonies. They continued to reproduce viviparously all through the winter and hence a supply of adults could always be obtained. The last two species lived on a number of different host plants and so could be raised under varying conditions. Another species, *Macrosiphum davisi,* had been observed for a year on the rose bushes and no winged forms ever occurred. Hence some work was done to try to produce some individuals with wings.

EFFECT OF INJURY TO HOST PLANTS

Starting out with what appeared to be the most promising methods of securing results, some experiments were run to determine the effect of injury of the host plant on the aphids. For this work some small pine trees infested with *Lachnus pini* were selected. The object was to injure the branches by girdling or partial girdling so as to shut off the flow of sap in the branch and determine the effect on the aphids.

Branch A was injured by cutting the bark and cambium layer for one-third of the distance around it; branch B had the bark cut through the cambium layer for two-thirds of the distance around; branch C was a check, uninjured. On each of these branches was placed a small colony of *Lachnus pini* in a cage. Another small tree was completely girdled around the base and a colony placed on it in a manner similar to the others. This colony is designated as D. A third tree was uninjured and a colony placed on it for a check, designated as E. These experiments were begun in November and were run for about two months, the results being recorded two or three times a week. The number of winged forms found each time were counted and the results tabulated.[2] The table shows that winged forms were produced in all the cages. On the first tree check colony C had approximately as many winged forms as colonies A and B which were on injured branches. Colony D also had a large number of winged forms but check colony E for a few weeks produced only apterous forms. Later on, however, winged ones appeared.

[2]The tables are necessarily omitted because of lack of space and instead the results are summarized. The photographs illustrating the work are also excluded.

A little later the experiment was repeated. Colony F was placed on another uninjured tree and colony G on a small tree which was girdled in a manner similar to the tree in the previous experiment. Colonies H and I were checks on uninjured branches of another tree. These were carried on as the previous experiments for several weeks with no decided results on wing production by injuring the host plant. The checks produced winged aphids about as consistently as did the injured limbs. Check colony E appeared for a time to be an exception to this rule, and it was thought that the tree on which they were living might be the cause of this. Consequently some of the apterous aphids from colony E were taken out and three new colonies started from them. Colony J was placed on a branch near A and B on tree No. 1, which had produced winged forms; colony K was placed on a limb of the girdled tree No. 4 by the side of colony D which had also produced winged forms; and colony L was moved to a new limb of tree No. 5, near colony E, for a check and to counteract any effect of moving the aphids to other trees. As the results show, winged aphids were produced not only in each of these three colonies, but also a little later in the original colony E.

About two months after being girdled one of the trees was turning very yellow from the effects. Therefore, two colonies of aphids were placed in cages on limbs of this tree, and two other colonies were placed on limbs of a healthy tree, as a check. All four colonies were taken from the same colony containing both winged and apterous forms. Here, also, during two months' time, winged forms were found in the checks in about the same ratio as in the colonies on the girdled tree. Therefore, the unhealthy condition of a pine tree due to girdling or any change which it may cause in the sap of the tree will not cause the aphids on it to produce wings in increased numbers over those on healthy trees.

Effect of Crowding on Wing Production. In many colonies it was observed that no winged forms appeared until several days after the colony was started, or until it had increased in size and often covered the limb thickly. Consequently the question arose as to whether or not the large number of aphids there caused the production of wings, either directly, or indirectly, by lessening the food supply. To investigate this point two colonies were started on a girdled tree. The first one, colony M, was placed on a limb of this tree on December 11 and allowed to

grow. A week later another small colony, (N), taken from the same place as the others, was placed on another limb. Colony M had a start on colony N and should be more numerous and show any effects of crowding sooner than N. The results show no difference. In fact colony M produced winged forms before N was even started and while there were only a few aphids there, and continued to produce them as long as the colony lived there. Therefore crowding as a probable cause of wing production was given up.

Effect on Myzus persicae of Injuring Cabbage Plants. This experiment was tried in the greenhouse insectary and its object was to see if unfavorable conditions of growth for a cabbage plant will cause aphids of the species *Myzus persicae* growing on it to produce wings and seek a new plant. Twelve potted cabbage plants were placed on the bench and covered with lantern globes, and divided into three groups. The first four had a cord tied lightly around the stem which would shut off the flow of sap to some extent. The next four were given no water and allowed to dry up. The third four were kept in a normal condition and used as checks. Each of the plants had a number of aphids placed on it and left for two weeks, the results being recorded each day or two. As the table shows, winged forms were produced on all of the plants without discrimination. In fact the total number on the four plants of each group is about the same. The results, therefore, do not argue in favor of the unhealthy condition of plants causing wings.

Mature Aphids. Eight adult apterous *Lachnus pini*, which had already produced some young, were placed on a cut stem which had already become partially dried out. All died in less than a week and produced no wings. It is hardly reasonable to believe that an adult could develop wings.

EFFECT ON APHIDS OF ADDING CHEMICAL SOLUTIONS TO THE FOOD OF THE HOST

Some experiments were next run to determine if changing the sap of the host plant by adding chemical solutions to its food would cause aphids on it to produce wings in order to seek a new host. Some of these chemicals would undoubtedly be taken up by the plant and consequently added to the dietary of the aphids. First, some cabbage plants which were infested with *Myzus persicae* were watered with solutions of magnesium sulphate of varying strengths. Small pots were filled with clean

white sand and some small cabbage plants, whose roots had been washed clean of all earth, were placed in them. The object was to remove all plant food, as far as possible, and give the plants nothing but what was in the solutions added. The plants were placed under lantern globes in the laboratory and divided into four groups of two plants each. One lot was watered with a 1% solution, one with a 5% solution and one with a 10% solution of magnesium sulphate, and the other with distilled water for a check. The sand was kept moist by watering every day and the results recorded daily. The 5% and 10% solutions were found to be too strong and the plants soon died. Some winged forms were found on all but two of the plants however.

The experiment was then repeated, this time using three per cent solutions which would not affect the plants so quickly. Eight cabbage plants were cleaned and potted as before and divided into four groups. One group was watered with a 3% solution of each of the following: magnesium sulphate, sodium chloride, tannic acid, and one group with distilled water for a check. In no case did the plants live more than a few days. They soon began to turn yellow, probably from lack of food, and consequently the aphids left them and started wandering around and died. As the table shows, wings were produced in some of them, but without much consistency. Although the checks produced no winged forms, one plant in each of the other groups showed none also. The experiment did not run over a long enough period to be conclusive. There was not sufficient time for the aphids to mature and show the effects of the chemicals. Besides we cannot prove that the plants took up any of the chemical solutions added, since the roots have the power of discriminating between the available foods. Therefore some attempts were made to rear them on cut stems in chemical solutions.

Experiments with Cut Stems. Eight young orange tips were cut from a tree and placed in small pots of clean white sand which were covered with lantern globes and set in the greenhouse on a shaded bench. On each of these cuttings were placed a number of aphids of the species *Aphis gossypii.* Two of them were watered with a 3% solution of each of the following chemicals: magnesium sulphate, sodium chloride and citric acid; and two were watered with distilled water for checks. The results were recorded as long as the cuttings kept fresh and the aphids

lived on them. However after a few days the leaves wilted and dropped and the aphids began to die. Some winged ones were produced on all but one of the cuttings, but with no regularity.

A little later the experiment was repeated, this time with *Myzus persicae* on orange cuttings. The cuttings were prepared as described above. Three or four dozen aphids were placed on each and watered with the same solutions as above and in the same order. The results as recorded show that wings were found in all but one, a cutting watered with sodium chloride solution. This cutting did not last very long before the leaves turned brown and dropped. In fact the cuttings watered with the chemical solutions showed the effects sooner than the checks in all cases. In this experiment the checks produced more winged specimens than any of the others except those watered with magnesium sulphate which produced about an equal number. Possibly this can be explained by the fact that the cutting did not wilt so quickly and hence more of the aphids had an opportunity to mature. At any rate, the wilting of the stems or the effect of the chemicals cannot be said to produce wings.

Lachnus pini on Pine Cuttings. Four branches were cut from a pine tree and placed in bottles one each containing a 3% solution of magnesium sulphate, sodium chloride and citric acid and distilled water. On each of these branches were placed about four dozen immature aphids of *Lachnus pini* which were allowed to mature. The mouths of the bottles were plugged with cotton and the whole bottle and stem covered over with a bell jar. Results show that in all cases except the check a majority of the aphids died while still immature and in the check also a large number died before becoming adult. The greatest mortality was noted on the stems kept in sodium chloride and citric acid. The leaves soon began to dry up there and the aphids died. In all cases however some winged ones were produced but most in the check. Here also we can say this is due to the fact that more of the aphids lived to become adult on the check.

Injections of Chemicals into Plants. To make more sure of getting the chemicals into the sap of the plant and thus adding them to the food of the aphids, they were injected into the growing stems with a hypodermic needle. This method was used on both cabbage plants and orange trees. Eight growing healthy cabbage plants were potted and placed under lantern globes in the open-air insectary. The same chemicals as used above were

injected into the stems. In two each was injected magnesium sulphate, sodium chloride and citric acid, in one distilled water and in one nothing. On each of these plants were placed twelve immature specimens of *Myzus persicae* about one week old. The plants were watered and kept in a healthy condition, and the aphids were allowed to mature there. The results show a few winged ones for each of the solutions, but not conclusive in favor of the chemicals. On one plant of each group all matured apterous.

The same experiment was later tried by injecting some of each of these chemicals into young orange tips and tying up in each twelve immature *Myzus persicae*. Chemicals in same order as above. Here, also some winged ones were produced in each case, but most in the checks.

Trials with Rose Aphids. A species of green rose aphid, probably *Macrosiphum davisi,* had been watched for over a year on rose bushes and no winged specimens were ever seen. Therefore an attempt was made to produce wings on some of them. Three cuttings of rose were made and placed in sand and watered: No. 1 with 1% magnesium sulphate, No. 2 with 5% magnesium sulphate, and No. 3 with water. On each cutting was placed several of the rose aphids. The rose cuttings however only remained fresh for a few days, when they wilted and the leaves fell. The aphids died and no wings were produced. The experiment was repeated a little later, this time by changing the cuttings about every three days and transferring the aphids to the fresh cuttings. In this way three generations were raised and about thirty individuals in each. All were apterous. No winged forms were produced not even in the second and third generations.

Effect of Chemicals on Plants. In all cases where cut stems were placed in chemical solutions it was observed that the checks in distilled water would last longer. A number of tests with cuttings used in solutions of varying strength of the above chemicals showed this always to be the case. The chemical solutions caused wilting the second day and dropping of the leaves in two or three days. The checks stayed fresh for five days. In all these cases the results were conclusive enough to show that the chemical solutions do have a deleterious effect on the cut plants, and plant physiologists agree on this point. Where the solution is strong enough it will have an osmotic pressure, which will

draw the sap from the cutting and consequently cause it to turn brown and wither. The fact that the checks always lasted longer, and therefore the aphids lived longer, is sufficient cause for the greater number of winged forms there. The experiment failed, however, to show that the chemicals in the stems will cause the aphids to produce wings, since the checks always produced as large a number of winged forms.

(To be continued)

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ON A COLLECTION OF THYSANOPTERA FROM RABUN COUNTY, GEORGIA

J. R. Watson

A vacation of fifteen days spent in north-eastern Georgia during the latter part of August and the first days of September, 1922, gave the writer an opportunity to compare the thrips fauna of that region with that of Florida.

There are no records of any considerable collection of thrips from this region. The nearest localities that have been intensively studied are about Clarksville, Tenn., where Morgan has collected, and about Washington, D. C., where Hood has done much of his collecting.

Rabun County is in the north-eastern corner of Georgia. It is high and mountainous, the elevations ranging from about 2000 feet to 3900. As to the vegetation: here we found most of our boyhood friends (and enemies too—such as nettles and burdocks) of northern Ohio. But in the valleys one notes such southern plants as bitterweed *(Helenium tenuifolium)* and sweet gums and on the mountain sides the belated blossoms of the sourwood *(Oxydendron arboreum)* were conspicuous. On the whole the vegetation is much like that of southern Ohio or Kentucky.

The first observation to be made was the scarcity of thrips as compared with Florida. They are by no means such an important part of the fauna as with us. They do not force themselves upon one's attention. One must hunt for them, otherwise he would scarcely discover their existence.

The most productive collecting was, as usual, in flowers. Even such an unlikely blossom as the Indian pipe supplied us with one.

But the Florida flower thrips *(Frankliniella bispinosa)* was entirely absent, its place being partly taken by its close relative *F. tritici.* But this insect was by no means as common as ours. It did not swarm in the blossoms, even of roses. Three or four per blossom was the maximum. Still this was the most common species. Numerous dissections of the heads of *Compositae* failed to discover any *Thrips abdominalis,* so common in the heads of composites in Florida.

Next after flowers these insects were most abundantly obtained by sweeping grass and weeds. Our most common species on grass, *Haplothrips graminis,* was entirely lacking. A new species of Haplothrips was obtained from grass but the most common species was *Frankliniella fusca.* This was much more common than in Florida, where it is known chiefly as a pest of tobacco, and nearly as common as its relative *F. tritici.*

Beating and sweeping shrubs brought in very few specimens. The most common was *Leptothrips mali,* the black hunter, a predaceous species that was quite apt to be found on any plant infested with plant lice. In vain were the young pines beaten for our pine thrips *Haplothrips pini.*

In all twenty-three species were taken, four of which proved to be new. *Thrips quinciensis, Haplothrips gracilis,* and *Hoplandrothrips flavoantennis* have hitherto been taken only in Florida. *Thrips impar* was described from Maryland and has not hitherto been reported elsewhere. *Frankliniella tenuicornis* has not heretofore been reported from America. Thus four species have had their known range considerably extended.

It is thus seen that the Thysanoptera, like the plants, show a mixture of southern and northern species.

A list of the species and their host plants follows:

THYSANOPTERA OF RABUN COUNTY, GEORGIA

Species	*Number taken*	*Host Plants*
Aeolothrips bicolor *Hinds*	3	Grass.
Sericothrips variabilis (Beach)	1	Shrubs.
Chirothrips insolitus *Hood*	1	Grass.
Malacothrips (?)	1	Weeds.
Heliothrips fasciapennis *Hinds*	9	Grass (8), smartweed *(Polygonum).*
Heliothrips haemorrhoidalis (Bouche)	1	Shrub.
Thrips quinciensis *Morgan*	2	in blossoms of *Vernonia* and *Polygala.*

Thrips crenatus n. sp.	3	Pine, *Lespedeza*, bitterweed.
Thrips impar *Hood*	6	Indian pipe, *Lespedeza* (4), grass.
Frankliniella fusca *(Hinds)*	35	Grass (29), pine (2), *Lespedeza* (4).
Frankliniella minuta *(Moulton)* (?)	1	Red Clover.
Frankliniella tenuicornis, *Uzel*	2	On grass (identified by R. C. Treherne).
Frankliniella tritici *(Fitch)*	36	A variety of blossoms.
Heterothrips auranticornis n. sp.	16	Blossoms of *Helenium*.
Haplothrips rabuni n. sp.	5	Grass.
Haplothrips statices *Holiday*	4	Grass.
Haplothrips verbasci *(Osb.)*	14	Mullein.
Haplothrips angustipennis n. sp.	2	Grass.
Haplothrips gracilis *Watson*	1	
Leptothrips mali *(Fitch)*	16	On many shrubs and herbs.
Hoplandrothrips flavoantennes *(Wats.)*	1	Oak.
Hoplandrothrips pergandei *(Hinds)*	1	Grass.
Idolothrips armatus *Hood*	1	On wild cane *(Arundinaria)*.

Thrips crenatus, n. sp.

Female. Length about 0.8 mm. (0.74 to 1 mm.). Color dark brown, thorax lighter with a little orange hypodermal pigment. Without prominent bristles except near the end of the abdomen.

Measurements: Head, length .075, width .105; Prothorax, length .113, width .15; Mesothorax, width .207; Abdomen, width .214; Antennae, total length .173 mm.

Antennal segment	1	2	3	4	5	6	7
Length	18	27	32	28	22	37	16 microns
Greatest width	19	21	18	18	15	16	7 microns

Head about a third wider than long and two thirds as long as prothorax into which it is deeply retracted. Cheeks very slightly arched. Plainly sculptured with transverse anastomozing lines, a row of minute bristles behind each eye. *Eyes* dark, large, occupying about two-thirds the length and .7 the width of the head; non pilose; facets large. *Ocelli* large, light brown; widely separated, posterior situated opposite the posterior two-thirds of the eyes; bordered by deep orange crescents. *Antennae* rather short, from twice to two and a third times as long as the head. Segments 1 and 2 but little lighter than the head; 3-5 varying from yellowish brown (lighter at the base) to dark brown concolorous with the others; 6 and 7 dark brown. 1 cylindrical, about as wide as long; 2 urn-shaped with a very broad base, conspicuously wider than any of the others; 3 urn-shaped, abruptly narrowed to a slender pedicel; 4 oval, 5 smaller, urn-shaped; 6 cylindrical; 7 conical. Sense cones and bristle all short, colorless, almost invisible; a sense cone on the outer apical angle of segment 3 thick and heavy.

Prothorax large, sides convex and diverging posteriorly, without sculpture, a short, colorless bristle on each posterior angle.

Mesothorax sculptured in the middle of the dorsal surface, sides bulging. Metathorax with nearly straight but diverging sides. *Legs* almost uniformly brown, but little lighter apically. *Wings* uniformly brown except for a small colorless area about .2 the length from the base. Costal fringe of hairs scanty, absent from basal half. Veins rather prominent; costal bearing from 23 to 26 bristles, the others from 5 to 7, scale 5.

Abdomen with a few short, brown bristles on segments 9 and 10. Dorsal surface faintly sculptured. The posterior margin of each segment is bordered with a series of about 20 rounded lobes. On the posterior segments these are more difficult to detect.

Male not seen.

Described from three females taken in Rabun Co., Ga., on *Lespedeza,* pine and bitterweed *(Helenium).* Readily recognized by the dark color, short intermediate antennal segments and crenated posterior borders of abdominal segments.

Type in the author's collection. Paratype in the National Museum.

Heterothrips auranticornis, n. sp.

Female. Color of the body a uniform deep brown, tip of fore femora, and both ends of others, and of all tibiae, and most of the tarsi, brownish yellow. Antennal segments 3 and 4 yellow, conspicuously shaded with orange.

Measurements: Total length, females 1.2, male .8; head length, females .112, males .107; width, females .15, males .133; Prothorax, length, females .13, males .128, width, females .22, males .18; Mesothorax, width, females .23, males .20; Abdomen, width, females .30, males .14; total, females .25, males .22.

Antennal segments	1	2	3	4	5	6	7	8	9
Length	20	30	55	39	28	32	24	20	19 microns
Width	19	26	53	35	27	28	19	18	15 microns

Head about a third wider than long, widest behind the eyes. Cheeks arched, roughened, and bearing a few short, stiff bristles. All the dorsal surface behind the eyes striated with a half dozen anastomozing lines. Frontal costa deeply emarginate. A row of four minute bristles behind each eye and posterior ocellus. One in front of each posterior ocellus and a minute one near the inner anterior angle of each eye, opposite the anterior ocellus. *Eyes* dark, very large, occupying about .7 the length and .8 the width of the head, non-protruding, pilose, facets very large. Posterior ocelli very large, situated opposite posterior third of the eyes and touching their margins. Anterior about half the diameter of the posterior and about the size of the facets of the eyes; situated on the edge of the frontal emargination and directed forward. *Mouth cone* reaching about half way across the prosternum; sides almost straight up to the prolonged but rounded apex. Antennae 9-segmented, 2.2 as long as the head. Segment 1 short and thick, concolorous with the head; 2 lighter; 3 and 4 yellow with considerable orange pigment; 5 at least two-thirds yellow but dark brown at the extreme

base and apex; 6 brown but yellowish on basal half; 7-9 dark brown. 3 long wedge-shaped with a narrow base; 4 and 6-9 barrel-shaped; 5 oval; 4-6 with short broad pedicels; margins, especially of 3 and 4, conspicuously crenate. Hairs and sense cones very pale, short and inconspicuous. A distal ring of sensoria on segments 3 and 4.

Prothorax but little longer than the head and 1.7 as wide as long; widest posteriorly. Anterior margin and sides nearly straight; posterior margin much arched. Dorsal surface striated posteriorly. A short, thick spine on each anterior angle and two on each posterior; a row of eight minute ones along the anterior margin and about a score of others, scattered over the dorsum. *Legs* rather slender. Fore femora but little thickened. Membranes of fore wings dark brown except two minute areas near the base; .075 mm. wide at the base (exclusive of scale); rather abruptly narrowed at about a third of their length to half the sub-basal width; length ten times that of the sub-basal width. Costal vein with about 31, anterior with 24 and posterior vein with 20 bristles.

Abdomen not pubescent but provided with a number of short bristles, a row along the posterior margin of each segment being especially prominent.

Males similar to the females but smaller. Fore femora considerably enlarged.

Described from fourteen females and two males taken from the heads of a composite *(Helenium)* in Rabun County, Ga. Type in the author's collection. Paratypes in the National Museum and in that of the University of Florida.

Haplothrips rabuni, n. sp.

Female. Length about 1.5 mm. Color dark brown to black with some reddish hypodermal pigment; antennal segment 3 and usually (but not always) fore tarsi and apical inner portion of fore tibiae yellowish brown.

Measurements: Head, length .20, width .166; Prothorax, length .122, width .241; Pterothorax, width .277; Abdomen, width .273; Tube length .108; width at base .054, at apex .031 mm. Antennae, total length .27 mm.

Segment	1	2	3	4	5	6	7	8
Length	21	40	41	46	42	40	37	26 microns
Width	27	26	22	29	27	27	26	14 microns

Head longer than wide, broadest at the middle, cheeks gently arched, slightly convergent posteriorly; vertex rounded, slightly produced. Postocular bristles fairly long but, like all the other bristles of head and thorax, almost or quite colorless and difficult to detect. *Eyes* medium sized, occupying slightly more than a third of the length of the head, not protruding, not pilose. Ocelli large, yellowish, the anterior on the extreme vertex of the head and directed forward, the posterior pair opposite the anterior third of the eyes. *Antennae* about a third longer than the head. Segment 1 (and sometimes 2) concolorous with the head; 3 yellowish brown; 4 and 5 light brown without yellowish bases; 6-8 darker brown; 1 short-

cylindrical; 2 urn-shaped; 3-6 oblong elliptical, 3 quite markedly pedicellate, 4-6 with broader, shorter pedicels; 7 barrel-shaped, truncate at the apex and broadly united with 8; 8 sub-conical. Sense cones and bristles short, colorless and inconspicuous. *Mouth cone* blunt, reaching past the middle of the prosternum.

Prothorax small, about .6 the length of the head and, including coxae, twice as wide as long. Coxa bears a short but thick and brown bristle, the only conspicuous one on the anterior portion of the body, others colorless, mostly blunt at apex; a pair on each posterior angle of medium length.

Pterothorax considerably wider than prothorax. Sides slightly converging posteriorly. *Wings* rather short, membrane reaching but little past the middle of the abdomen; colorless except for a decidedly brown area at the base of the primaries; primaries markedly narrowed in the middle, fringe rather sparse, of medium length, with 6 or 7 interlocated hairs. *Legs* rather slender, except fore tarsi and tibiae, concolorous with the body; fore femora but slightly enlarged; fore tarsus with a small, short, acute tooth.

Abdomen rather long and slender, bristles rather short, light brown to colorless and pointed. Tube rather short, terminal bristles but little longer than the tube.

Male not seen.

Described from four females taken from grass and sedges along a small stream at Clayton, Rabun County, Ga. Type in the author's collection. Paratypes in the National Museum and in that of the University of Florida.

Close to H. graminis Hood, but differs in the shorter and darker antennae, darker color, smaller prothorax, larger pterothorax, longer, more slender abdomen, longer intermediate antennal segments and colorless bristles.

Haplothrips angustipennis, n. sp.

Female. Body length about 1.3 mm. (from 1.14 to 1.46). Color almost uniformly dark mahogany brown, fore tibiae and tarsi and intermediate antennal segments yellowish brown.

Measurements: Head, length .185, width .151; Prothorax, length .12, width .25; Mesothorax, width .25; Abdomen, width .227; Tube, length .106; width at base .061, at apex .031. Antennae, total length .29 mm.

Segment	1	2	3	4	5	6	7	8
Length	26	37	45	50.5	44	40	38.5	26 microns
Width	26	24	20	25	23	23	21	16 microns

Head about a third longer than broad. Cheeks slightly arched, converging slightly posteriorly, somewhat roughened and bearing a few short bristles. Postocular bristles conspicuous, pointed, nearly as long as eyes. Eyes large, occupying nearly half the length of the head, not pilose, facets large. *Ocelli* large, larger than facets of the eyes, brownish yellow, posterior pair situated opposite the anterior .4 of eyes and contiguous with their

margins; anterior directed forward. *Mouth cone* reaching about half way across the prothorax, abruptly constricted near the base but very broadly rounded at the apex. *Antennae* 8-segmented. Segment 1 cylindrical, concolorous with the head; 2 urn-shaped, abruptly constricted to a very broad pedicel, concolorous with the head except the yellowish brown apex; 3 obovate, narrower than either 2 or 4, gradually narrowed to a broad base, yellowish brown, darker along the sides and with a broad, colorless band at the apex, usual sense cones present but colorless and inconspicuous; 4 ovate with a short, broad pedicel, basal third concolorous with 3, but remainder darker, the colorless collar at the apex narrow; 5 and 6 barrel-shaped, pedicel shorter and narrower than in 4, dark brown; 7 cylindrical, sides but slightly arched and converging slightly apically; 8 unusually large, margin conspicuously crenate. All antennal bristles thin, pale brown and inconspicuous.

Prothorax (including coxae) about twice as wide as long, trapezoidal in outline, much widened posteriorly, posterior margin arched, posterior angles abruptly rounded and bearing a pair of sharp-pointed, light colored bristles of medium length; coxae each bearing one short, dark, thick bristle and a pair of very short, thorn-like spines; anterior angle with a short heavy bristle.

Mesothorax broad, with very acute anterior angles and nearly straight sides which converge slightly posteriorly. *Mesothorax* somewhat narrower, sides more arched and more constricted posteriorly. *Wings* rather weak, membrane scarcely reaching the eighth abdominal segment, quite narrow except at the extreme base, unusually deeply constricted for a Haplothrips, to a diameter about half that nearer the apex. Fringing hairs moderately long, seven interlocated ones. *Legs* rather slender, dark, fore femora but little thickened; fore tarsus with a small tooth.

Abdomen long and slender, destitute of conspicuous bristles, those of the ninth segment shorter than the tube. Tube of moderate size, sides slightly concave, terminal bristles about as long as the tube.

Male not seen.

Described from two females taken from coarse marsh grasses at Clayton. Type and paratype in the author's collection.

Hoplandrothrips flavoantennis (Wats.)

The female only was originally described. *(Liothrips flavoantennis,* Ent. News, March 1916, p. 129.) A male was collected in Georgia.

Male. Color uniformly dark brown except antennal segments 3-8, which are bright yellow. (In some females also segment 8 is yellow, also segment 2 may be brown.)

Measurements: Total length 1.7 mm.; head, length .235 mm., width .18 mm.; prothorax, length .13 mm., width including coxae .29 mm.; meso-

(Continued on page 47)

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THE ENTOMOGENOUS FUNGI

October was an unusually rainy month in Florida. According to the Weather Bureau the average for the state was 8.28 inches above normal, and only one station in peninsular Florida (New Smyrna) reported a deficiency. There was not a single day without rain at some station. Due undoubtedly to this meterological condition the entomogenous fungi have been unusually efficient this fall thruout the citrus belt. A careful count of some hundreds of citrus leaves at Gainesville showed that the fungi had killed 97.2% of the fall brood of whitefly—a percentage of kill seldom equalled in commercial spraying. In the order of their efficiency the fungi ranked as follows: the brown fungus, the red aschersonia, *Microcera*, the cinnamon fungus.

RECENT PUBLICATIONS

Bulletin 165 of the Experiment Station and the October number of the Quarterly Bulletin of the State Plant Board are of unusual interest and importance to Florida and other cotton-growing states. In this bulletin Mr. Geo. D. Smith presents "A Preliminary Report Upon an Improved Method of Controlling the Boll Weevil". "The gist of the method may be summarized in two sentences, as follows:

1. Remove all squares from the cotton plants about June 5 and destroy them.

2. Follow this at once with a thoro application of calcium arsenate or lead arsenate, using a suitable dusting machine."

These measures reduce the weevils to such small numbers that the cotton is enabled to set a good crop of bolls before the weevils again become abundant. Where this method of control has been tried the past year practically as much cotton has been harvested as would have been gathered were no weevils present.

The principle underlying this method of control is that towards which the best practice in economic entomology is steadily tending, viz., a very thoro cleanup of the insect and hence less need of frequent repetition, as near an approach to eradication as is practicable rather than temporary palliatives. This method of dealing with the boll weevil parallels quite closely the latest recommendations for the control of the curculio in peaches and plums, i. e., to pick up and destroy the drops with their contained larvae as well as poisoning the adults.

Farmers' Bulletin 950, by Philip Luginbill, treats of the Southern Corn Rootworm (Diabrotica 12-punctata). Altho a common insect in Florida, this beetle is with us not a serious pest of corn. In the extreme northern part of the state it takes a small percentage of the young corn. The author recommends planting in late April to escape damage from this insect. This beetle is very common in oat fields about Gainesville from January to March.

Dr. H. S. Davis, until a year ago head of the department of zoology in the University, is the author of "A New Bacterial Disease of Fresh Water Fishes"—Document 924, U. S. Bureau of Fisheries.

Carl B. James, Horticulturist for the L. and N. Ry., has recently published a very attractive and valuable bulletin on the satsuma orange.

THE SCOLDING BUTTERFLY

Dear Friends of the Entomological Society:

When a person arrives in a new country, the first things that attract his attention are the objects and customs to which he is not accustomed in his own country. So it was with me when I

arrived in Brazil. I saw hundreds of interesting and important things that the average Brazilian, who has lived among them always, "never saw". Brazil, as you know, is noted for its magnificent butterflies and gigantic insects of various orders. Some of the unusual insects are credited with being extremely venomous. I was told of one insect so venomous that if it lights on the trunk of a tree, the tree dies from the effects. Entomologists, being extremely innocent, capture these insects with impunity. The thing I want to tell you about today is the Scolding Butterfly, *Ageronia feronia,* L.

My friends in Florida will naturally think that I have gone "louco" with the heat. But remember that in Brazil we are now in mid winter, and some mornings the weather is dreadfully cold (?). At least my Brazilian friends say that it is. And the Centigrade thermometer says that the temperature is some seven or eight degrees above zero. Now what I was going to tell you about is the butterfly that has a voice. I am sending you a photograph that represents her sitting on a palm tree. I know that it is a female which does the talking because the voice is high keyed and staccato. A male never could get up so much energy.

The scolding is done probably with organs similar to those used by crickets or katydids. The sound is not quite as strong as that of the big katydids nor of the big black cricket. Organs similar to those possessed by these insects are located near the base of the wings. They make this snapping noise only when on the wing. Sometimes they scold their mate and sometimes they scold the entomologist who is passing by.

Another peculiarity of this species is that it looks very much like the lichens that inhabit tree trunks. The photograph I enclose you brings out this peculiarity very strikingly.

Now if there is any entomologist present who doubts the correctness of these observations, let him look up Holland and also Sharp, who likewise became affected with the Brazilian heat.

Very truly yours,

(Signed) P. H. ROLFS.

Vicosa, E. F. Leopoldina,
Minas Geraes, Brazil.
July 27, 1922.

HYMENORUS OBSCURUS AS A PEST OF CITRUS (COL. CISTELIDAE)

J. R. WATSON

Occasionally one sees on the bark of citrus and other trees a dense colony composed of hundreds of little black beetles. The beetles are oval in shape, less than a quarter of an inch long and covered with grayish-brown hairs. In the late afternoon the beetles leave their resting place and go in search of food which consists mostly of lichens and other growths on the bark of the trees. But it seems that they may occasionally become pests. In July Mr. S. B. Jones of Orchid, Fla., sent in to the Experiment Station a number of these beetles with the statement that they had been feeding extensively on "June bloom" and other tender growth of his trees. In confinement they feed greedily on tender citrus foliage.

The writer has also recently caught these beetles eating out freshly inserted buds in a nursery. It would seem that this beetle must be included among the minor pests of a citrus tree.

This beetle should not be confused with the downy darkling beetle *(Epitragus tomentosus)*, which it considerably resembles in shape and color. The latter is larger, never collects in colonies, and is one of the most beneficial insects in a citrus grove. Its food habits are very similar to those of lady beetles and in many groves it is much more abundant than even the twice-stabbed lady-beetle.

A NEW CITRUS INSECT

A caterpillar recently found feeding on the leaves of a young grapefruit tree at Orlando, Florida, proved on rearing to maturity to be *Prodenia latifascia* Walker.

Altho this insect probably is of no economic importance as a pest, its presence seems to be a new record for citrus insects. Hence this note may be of interest.

The identification was made by Mr. Wm. Schaus of the National Museum, who says that *P. latifascia* Walker is essentially a tropical insect found from Mexico to Argentina, including Jamaica, Cuba, Haiti, St. Lucia. The only previous records of its breeding in the United States is one each from onions and alfalfa in Texas. Nothing is known of its host plants in other countries.

The insect belongs to the cut worm family and resembles somewhat, both in larval and adult form, some of our common pests, as the sweet potato caterpillar, *P. commelinae,* and the cotton boll cut worm, *P. ornithogalli.* When full grown the larva was about 2 inches long and of a brownish gray velvety color with a wide dark band down the dorsal surface and 3 narrow golden brown stripes along each side; ventral surface greenish brown.

It pupated July 31st in soil and the moth emerged August 17, 1922.

ARTHUR C. MASON.

THE PSOCID OF THE OAKS

FRANK STIRLING

Thruout the south-eastern United States, especially in Florida, the water oaks frequently take on a bright silvery-grey coloring which shows particularly on the larger limbs and trunks. Close observation shows this to be caused by a silky web which completely covers the surface. This web is of a bright, clear color and glistens in the sun and on bright moonlight nights, making an effect well worth noticing.

By removing a part of the web with a pen knife or sharp stick one may, by carefully observing, note countless numbers of a tiny insect. This little insect is known as a psocid (Psocus sp.) and is related to the book-lice. These psocids are useful rather than injurious, as they feed on fungus growths and lichens which grow on the trunks and larger limbs of the oaks. They apparently spin this fine, gauzy web for their protection against birds and other enemies which would otherwise destroy them.

This insect is reported as occurring in especial abundance on water oaks in the vicinity of Lakeland, Orlando, Sorrento, Dade City and Gainesville, Fla., along the Gulf Coast in the vicinity of New Orleans, La., and near Mobile, Ala. To those not informed the appearance of this grey, silvery covering is often viewed with alarm.

The webs, together with the insects, will disappear after a short time and the only effect upon the tree will be a cleaner and healthier appearance of the bark.

A NEW THRIPS FROM CITRUS IN ALABAMA

J. R. WATSON

Haplothrips harnedi, n. sp.

Female. Dark brown, 3rd antennal segment and distal half of tibiae yellowish brown.

Measurements: .Total length 1.36; head, length .18, width .13; prothorax, length .15, width .24; mesothorax, width .22; abdomen, width .27; tube, length .108, width at base .057, apex .033.

Antennal segment	1	2	3	4	5	6	7	8
Length	28	45	45	48	40	38	39	27 microns
Width	30	28	25	26	23.5	21	17.5	11 microns

Head a third longer than wide; dorsal surface with a few faint cross striations; cheeks slightly convex, converging a little posteriorly. Postocular bristles nearly as long as the eyes, with dilated, colorless tips. *Eyes* medium sized, not protruding, not pilose, black, triangular in outline. *Ocelli* medium sized, widely separated, anterior situated far forward, posterior pair opposite the anterior .4 of eyes and near their margins, bordered by dark crescents. *Mouth cone* broadly rounded, reaching scarcely to the middle of the prothorax. *Antennae* 1.6 times as long as head; segments 1, 6, 7, and 8, concolorous with the head, 2 and 5 a little lighter, 4 considerably lighter, 3 brownish yellow to yellowish brown with colorless apex; sense cones colorless and inconspicuous, spines small, light brown.

Length of prothorax a little greater than width of head, width (including coxae) 1.6 times the length. Prominent spines near the anterior angles, on coxae, and near the posterior angles; all with dilated tips.

Pterothorax distinctly narrower than the prothorax, sides straight, converging posteriorly. *Legs* rather short, femora lighter than the body; fore pair slightly enlarged. *Wings* rather weak but membrane reaching the fifth segment. Fringing hairs sparse, about three interlocated ones on primaries.

Abdomen variable in shape. In some individuals excessively long and slender, in others but little more than twice as long as wide. Bristles few; some of those on the last segment have dilated tips but the longest have acute tips. *Tube* rather small, sides rather abruptly dilated at the base; terminal bristles short.

Male not seen.

Described from nine females collected on citrus trees in southern Mississippi and sent to the author by Prof. R. W. Harned. Type in the author's collection. Paratype in the National Museum.

Close to *H. funki* Watson, but differing in the darker color of the tibiae, tarsi, and third antennal segment, smaller size, relative lengths of antennal segments and especially the narrow pterothorax.

PERSONALS

Dr. Carl J. Drake is now state entomologist of Iowa.

Dr. Wilmon Newell has been called north by the death of his father.

Mr. W. L. Goethe is teaching science in the Live Oak High School.

The potato growers of the Hastings district sent Dr. C. D. Sherbakoff to Maine to select seed for them.

Mr. C. M. Berry spent part of the summer in New York State inspecting sources of seed used by the Sanford growers.

Dr. W. S. Blatchley left Indianapolis on November 14 for Rio de Janeiro, Brazil. He expects to return to Dunedin the last of March.

Mr. A. H. Beyer, assistant entomologist of the Experiment Station, plans to spend several weeks at Harvard studying entomogenous fungi.

According to Science Mr. John Belling, former plant breeder in the Experiment Station and now of the Eugenics Laboratory at Cold Spring Harbor, N. Y., received the doctorate from the University of Maine in June.

Dr. H. S. Dozier, former assistant in the Experiment Station, is in charge of the camphor scale investigations of the U. S. Bureau of Entomology and is stationed in New Orleans. He received the doctorate from Ohio State in June.

REPORT OF MEETINGS OF THE FLORIDA ENTOMOLOGICAL SOCIETY

September 25. The Society met in Language Hall at 4:30 o'clock, President Stirling in the chair. Those present were: Beyer, Chaffin, Goodwin, Merrill, Montgomery, Rogers and Watson. New members elected were: Miss Georgia Berger, teacher of Biology in Tampa High School; Miss Bernice Dew and Rudolph Baldwin, teacher and student in Alachua High School; and Mr. S. E. Neal, of the firm of Neal & Neal of Jacksonville.

The question of continuing the joint meetings with the Horticultural Seminar was discussed and referred to the Executive Committee.

Under "Brief and Timely Notes" Prof. Watson spoke of observations on the Mexican Bean Beetle in Rabun County, Georgia, and the capture of the greenhouse thrips out of doors. Mr. Goodwin reported the discovery of European Foul brood in Seminole County.

The address of the evening was given by Dr. J. S. Rogers, on the Museum of Zoology of the University of Michigan. This is a research museum rather than an exhibition museum. Dr. Rogers spoke of the progress made in surveys of the different groups, particularly insects. The talk was very interesting and showed that Dr. Rogers is doing a great part in the carrying out of their plans by working up the family Tipulidae (crane flies) of the order Diptera.

November 1. The Society met in joint meeting with the Horticultural Seminar, Major Floyd in the chair.

Members present: Montgomery, O'Byrne, Chaffin, Beyer, Lord, Watson, Berger, Stirling, Merrill, and Stone. Mr. E. R. Mezgler of Hightown, N. J., was elected to membership.

The paper of the evening was by Professor Floyd on "A Proposed Score Card for Judging Citrus Lands". It was freely discussed by members present.

A. H. BEYER, Secretary.

ON A COLLECTION OF THYSANOPTERA FROM RABUN COUNTY, GEORGIA

(Continued from page 39)

thorax, width .29 mm.; abdomen, greatest width .29 mm.; tube, length .16 mm., width at base .064 mm., at apex .034 mm. Antennae, total length .44 mm.; segment 1, 27; 2, 50; 3, 77; 4, 77; 5, 69; 6, 67; 7, 55; 8, 29 microns.

Head about 1.5 times longer than wide. *Eyes* large, occupying nearly a third the length of the head and fully a third of the width, slightly protruding, non-pilose, red by reflected light. Ocelli large, yellowish, situated far forward. The anterior on the large frontal lobe between the bases of the antennae and directed forward. The anterior margins of the posterior pair about opposite the anterior margins of the eyes. *Mouth cone* long, tapering, almost reaching the mesosternum. *Antennae* long and slender,

nearly twice as long as the head. Segment 1 and base of 2 concolorous with the head, apex of 2 lighter brown; remaining segments clear bright yellow. Abdomen long and slender, tapering gradually to the 8th segment and then more abruptly; bristles on the posterior angles of the segments progressively longer, those on the 9th nearly as long as the tube. Tube long and slender. Otherwise identical with the female.

Described from a single male taken from oak at Clayton.