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A NEW FRANKLINIELLA FROM FLORIDA (THYSANOPTERA)

J. R. WATSON

***Frankliniella bratleyi* n. sp.**

MACROPTEROUS FEMALE TYPE: Length 1.3 mm.; color by reflected light: pale sulfur yellow (Ridgeway's color standards), head and basal segments of abdomen lighter, grayish yellow, antennal segments I, III, all but apex of IV, V, and basal half of VI, gray, almost colorless, II concolorous with the head, apices of IV, V, VI and VII and all of VIII dark brown; eyes dark red, ocellar crescents red: by transmitted light, body and legs and antennal segments I, II, III all but apices of IV and V, basal half of VI and VII, uniform pale straw yellow, apices of segments of IV, V, VI, abruptly light brown, segment VIII darker brown; eyes black, ocellar crescents ferruginous.

Head about as wide as long, bluntly angular in front, broadest across the somewhat bulging eyes, cheeks nearly straight, diverging slightly posteriorly; eyes occupy a little less than half the width of the head and a little less than two-fifths of its length; posterior ocelli opposite the middle of the eyes but separated from the margins by about their diameter, light straw yellow; interocellar bristles pale but long (37 microns) and straight, extending beyond the head, situated on the line from the anterior to the posterior ocelli, and far behind the anterior ocellus, postocular bristles also pale, variable in length, in the type less than half as long as the interocellulars but in some paratypes about as long, curved, mouth cone broad, reaching about .7 across the prosternum.

Prothorax about a third wider than long, sides nearly straight and parallel; spines pale, those at anterior angles 78 microns long, those at posterior angles 83, anterior marginals very small. Mesothorax three-eighths wider than prothorax; legs rather short; wings reaching to the 9th abdominal segment, membrane of the fore wings narrow, about one sixteenth as wide as long, fringe very long, costa carries 22 bristles, anterior vein 18, posterior 12, all pale yellow.

Abdomen widest at about segment 6, then rounding to the last which is sharply conical.

Measurements of type: Length 1.3 mm. (varying in paratypes from 1.0 to 1.5 mm.); head, length 0.12 mm., width across cheeks 0.146 mm.; prothorax, length, 0.122 mm., greatest width 0.195 mm.; mesothorax, greatest width 0.27 mm.; abdomen, greatest width 0.26 mm.; bristles on 9th segment 146 microns long.

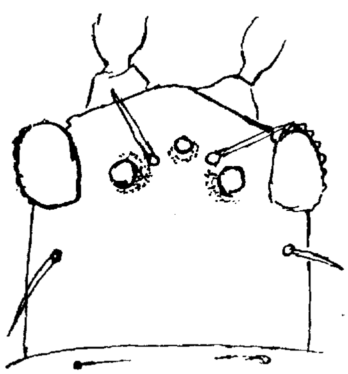
Antennal Segments	I	II	III	IV	V	VI	VII	VIII	
Length	24	37	59	51	39	61	12	15	
Width	34	27	22	17	17	19	7	5	microns

MICROPTEROUS FEMALE: Identical with the macropterous females in color and shape. The rudimentary wings usually not attaining the abdomen.

Measurements of type: Length 1.19 mm.; head, length 0.146 mm., width (across the cheeks) 0.146 mm.; prothorax, length 0.122 mm., greatest width 0.195 mm.; mesothorax, greatest width 0.24 mm.; abdomen, greatest width 0.28 mm.

Antennal Segments	I	II	III	IV	V	VI	VII	VIII	
Length	24	44	56	48	39	51	12	17	
Width	36	26	23	22	18	22	7	5	microns

Postocular bristles .029 mm.; interocellar .041 mm.; at anterior angles of prothorax .061 mm.; at posterior .073 mm.; on abdominal segment IX, .161 mm.



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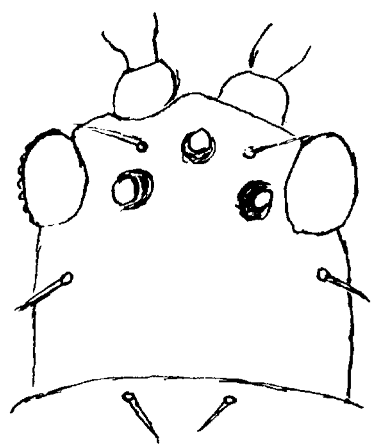

b

Heads of *bratleyi* (a) and *unicolor* (b).

Described from 97 females taken by Mr. H. E. Bratley after whom this species is named, on bulbs of tube roses, at Gainesville, Florida, on December 20, 1933. The bulbs were perceptibly injured.

This species is very close to Morgan's *unicolor* (Can. Ent. LVII, p. 141). The most conspicuous difference is in the coloration of the antennae. In *unicolor* segments III and IV and basal half of V are uniformly "light stramineous" and distal half of V, and VI-VIII uniformly fuscus, whereas in *bratleyi* the apices of segments IV and V and the apical half of VI are abruptly much darker.

The position of the interocellar bristles differs in the two species. In *unicolor* they are definitely situated outside of the ocellar triangle, and "almost on a line with inner margins of posterior ocelli." This character was first called to the author's attention by Dudley Moulton, to whom slides had been sent. The ocelli are placed nearer together in *bratleyi* and farther from the margins of the eyes. The margins of the ocellar crescents are not as clearly defined. The characters, except the color of antennal segment VII, are very constant in the paratypes.

CORRELATION OF SUGAR YIELDS WITH THE PERCENT OF JOINTS BORED BY *Diatraea saccharalis* (F.)

SUGARCANE BORER STUDIES—I

J. W. WILSON[1]

A number of papers discussing the effect of the Moth cane borer *Diatraea saccharalis* (F.) upon sugarcane have been published. An early paper cited by Van Dine (1912) is that of Fernando Lopez Tuero (La Cana de Azucar en Puerto Rico, su Cultivo y Enfermedad, 1895). In this paper Tuero describes the losses due to fermentation and states that in heavily infested fields the losses "are likely to be so great as to make it useless to harvest the crop." Stubbs and Morgan (1902) gave the first estimate of borer damage to cane in Louisiana. Barber (1911) on the basis of samples of bored and unbored canes of the variety D 74 place the sugar losses per ton of cane at 37.29 pounds. These early writers on this subject point out that losses are not limited to the loss of sugar in mature cane.

At the 1932 meetings of the International Society of Sugar Cane Technologists Hinds (1933) presented a paper on the methods of estimating the abundance of *Diatraea saccharalis* (F.) which provoked considerable discussion. For a number of years a determination of the percent of joints showing external injury has been used by the Entomologists of the United States Department of Agriculture in Louisiana as a measure of the abundance of the borer and the extent of damage caused by this insect. This method has also been used at the Everglades Experiment Station for the past four years. Jaynes and Bynum (1941) in their study of the relationship between the number of internally bored joints and the joints showing external injury found a very high correlation coefficient. With the knowledge of this high degree of correlation a determination of the percent of joints externally injured can be used as a dependable guide to the abundance of the sugarcane borer. However, a determination of the percent of joints bored in a particular cane field does not provide an estimate of the amount of sugar lost

[1]The author wishes to express his appreciation to Mr. F. D. Stevens for making the analyses and to Doctors Thomas Bregger and Roy A. Bair for advice and assistance. Acknowledgment is also due the United States Sugar Corporation for permission to visit its fields and take samples at will, and to the officials of the corporation, especially Dr. B. A. Bourne, Messrs. F. E. Bryant, Harry Vaughn, W. P. Jernigan and J. V. Fourmy for their helpful cooperation.

due to borer attack. Such an estimate of the degree of economic losses would be very useful to Entomologists studying methods of controlling the borer. A knowledge of the sugar losses attributable to borer attack would be particularly useful in the Florida Everglades where the average percent of joints bored is low.

The author is well aware of the difficulties of obtaining an accurate and dependable estimate of sugar losses. Soil variability, differences in the time of harvesting different fields, age of the cane, annual climatic variations, the individual characteristics of the varieties grown and a number of other factors influence the yield of sugar and make it difficult to determine the losses ascribable to a single variable such as the percent of joints bored. Nevertheless, the need for figures to determine whether or not control measures can be used economically in fields having low borer populations, seemed to outweigh the obstacles involved. This paper is a report on the results obtained from a study conducted during the crop season 1941-42 on cane grown on the peat soils of South Florida. Physiological and ecological phases of the problem are now being studied and will be reported upon in the future.

The samples of cane were taken in series of from two to six at a single location, in fields being harvested from November to April. In most fields two or three series of samples were taken from a like number of locations. In some cases the analysis showed a wide variation in the yield of 96° sugar between samples taken in the same field. Each series of samples consisted of 10 full length unbored canes and as many samples of 10 full length bored canes as could be conveniently obtained. Each sample of bored canes was selected in such a manner as to fall in one of the following classes: 5 to 10, 10 to 15, 15 to 20 and over 20 percent of the joints bored. Of the 108 samples taken 27 were unbored, 22 were in the 5 to 10 percent class, 17 in the 10 to 15 percent class, 19 in the 15 to 20 percent class and 20 in the class having over 20 percent of the joints bored. Ten of the samples in this latter class had between 20 and 25 percent of the joints bored, 5 samples had between 25 and 30 percent, 4 had between 30 and 40 percent and 1 sample had 43.8 percent of the joints bored. In all cases the words "joints bored" refers to external injury. The samples were tied, labeled in the field and brought to the laboratory where they were crushed in a small mill driven by a gasoline motor. Horne's dry lead method of analysis was used from which sugar yields were calculated on a basis of 78 percent mill extraction and assuming the juice recovery of all varieties to be the same. The three varieties F31-962, POJ 2725 and F31-436 are the principal ones grown in the Everglades. For this reason the study was limited to these varieties.

TABLE 1.—AVERAGE NUMBER OF POUNDS OF 96° SUGAR, POUNDS OF SUGAR LOST AND PERCENT OF SUGAR LOST PER TON OF CANE DUE TO VARIOUS PERCENTAGES OF JOINTS BORED.

		Cane Varieties			
		All Varieties	F31-962	POJ 2725	F31-436
Number Samples		108	44	33	31
Un-bored	Lbs. 96° Sugar	219.35	224.94	206.32	222.63
5-10% Joints Bored	Lbs. 96° Sugar	207.91	208.17	197.02	214.80
	Lbs. 96° Sugar Lost	13.61	19.18	12.00	8.94
	% Sugar Lost	6.20	8.52	5.82	4.02
10-15% Joints Bored	Lbs. 96° Sugar	203.75	202.72	198.68	213.93
	Lbs. 96° Sugar Lost	19.07	29.20	8.22	10.15
	% Sugar Lost	8.69	12.98	3.98	4.56
15-20% Joints Bored	Lbs. 96° Sugar	191.49	186.06	191.54	206.74
	Lbs. 96° Sugar Lost	28.33	38.51	16.45	26.98
	% Sugar Lost	12.92	16.96	7.97	12.12
Over 20% Joints Bored	Lbs. 96° Sugar	182.41	181.93	176.14	192.25
	Lbs. 96° Sugar Lost	35.93	44.03	31.33	36.09
	% Sugar Lost	16.38	19.57	15.18	16.21

In Table 1, a summary of the data, it will be noted that with the single exception of the 10 to 15 percent class of POJ 2725, the number of pounds of 96° sugar per ton of cane decreases with an increase in the percent of joints bored. This indicates a negative correlation, which is borne out by the scatter diagram in Figure 1 and the highly significant correlation coefficients given in Table 2. Referring again to Table 1, in the case of the

Figure 1. Dot diagram of all varieties of sugar cane. Regression equation X = -0.2429y + 61.22

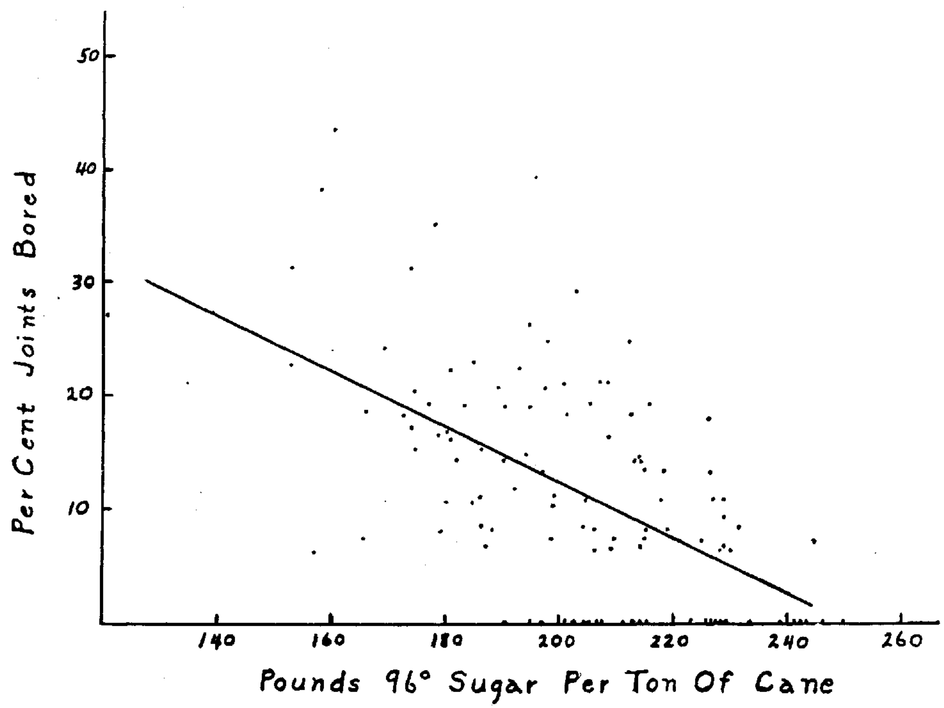

TABLE 2.—CORRELATION OF POUNDS OF SUGAR PER TON OF CANE WITH PERCENT OF JOINTS BORED.

	Cane Varieties			
	All Varieties	F31-962	POJ 2725	F31-436
Number of Samples	108	44	33	31
Correlation Coefficient	—0.585	—0.671	—0.521	—0.472
Observed* r at 1%	0.254	0.393	0.449	0.456
Regression Equation	X=—0.2429y +61.22	X=—0.2951y +71.98	X=—0.2445y +60.98	X=—0.1787y +46.72

*From Snedecor's Table of Correlation Coefficients at the 1% levels of significance p. 125 Statistical Methods 1937, College Press, Inc., Ames, Iowa.

averages for the three varieties, the amount of loss is practically constant at seven pounds from one class to the next highest. For F31-962 the losses are again constant but the amount is approximately 10 pounds of sugar. In the cases of POJ 2725 and F31-436 these losses are not constant but the amount of sugar lost by the over 20 percent class is almost double that of the 15 to 20 percent class. It should also be pointed out that F31-962 is small barrelled, early maturing and has over 12 percent fiber, whereas POJ 2725 and F31-436 are both large barrelled, late maturing and have less than 10 percent fiber. Since the sugar yields were calculated on a basis of equal fiber content this gives F31-962 a higher sugar yield than is actually the case. This, however, does not enter into the figures given as losses due to borer, because all of the comparisons were made between bored and unbored samples taken at the same time and location in the field. It may be noted also that F31-962 suffered much greater losses than the other two varieties, and F31-436 losses were slightly higher than those of POJ 2725.

TABLE 3.—MONETARY LOSSES PER ACRE DUE TO BORER, CALCULATED ON A BASIS OF 3.74¢ A POUND FOR 96° SUGAR F.O.B. NEW YORK AND AN AVERAGE YIELD OF 37.5 TONS OF CANE.

		Cane Varieties			
		All Varieties	F31-962	POJ 2725	F31-436
5-10% Joints Bored	Lbs. 96° Sugar Lost	510.38	719.25	450.00	335.25
	Value in Dollars	19.09	26.90	16.83	12.54
10-15% Joints Bored	Lbs. 96° Sugar Lost	715.13	1095.00	308.25	380.63
	Value in Dollars	26.75	40.95	11.53	14.24
15-20% Joints Bored	Lbs. 96° Sugar Lost	1062.38	1444.13	616.88	1011.75
	Value in Dollars	39.73	54.01	23.07	37.84
Over 20% Joints Bored	Lbs. 96° Sugar Lost	1347.38	1651.13	1174.88	1353.38
	Value in Dollars	50.39	61.75	43.94	50.62

In Table 3 the losses are figured on an acre basis, assuming an average yield of 37.5 tons of cane per acre and at the ceiling price of 3.74¢ a pound. These figures will be particularly interesting to growers and economic entomologists. Ingram and Dugas (1941) reduced the first generation borers 92 to 97 percent by four applications of Cryolite at seven day intervals. They estimated the total cost of four applications to be $3 to $4 an acre, and the net resulting increase in one large scale experiment to be $11 an acre. If the borer population can be sufficiently reduced by applying insecticides for the control of the first generation borers, it can be readily seen that these applications would be economically feasible even in cases where borer injury has amounted to only 5 to 10 percent of the joints bored.

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June 12, 1941

Mr. Manuel Turner of the General Extension Division, University of Florida, advises that he observed a mole cricket fly through an open window into his office on the ninth floor of the Seagle Building about 10:00 p. m. Mr. Turner thinks mole crickets are high fliers.

Ants had so far destroyed the specimen by morning that an attempt at further identification was abandoned.

—E. W. BERGER

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THE SPREAD OF THE MEXICAN BEAN BEETLE

The Mexican bean beetle, *Epilachna varivestris* Muls., since its introduction into Alabama has spread rapidly to the north and east but much more slowly to the south. The first beetles captured in Florida were taken at Monticello by the late Mr. Fred Walker, about twelve years ago. This colony seems to have died out as did one at Thomasville, Georgia, just across the line. The beetle is now generally distributed throughout the part of Florida west of the Apalachicola River.

During May 1942 it was found in three widely separated localities in Alachua County, at Gainesville, at Hawthorn, and at Island Grove. The nearest known infestation before this discovery was at Havana in Gadsden County, about a hundred and seventy-five miles to the northwest. This colony in Gadsden County has been quite destructive for several years.

This raises an interesting question as to how it got to Alachua County. All the colonies are small, indicating that the beetle has not been here long. That it should appear in three localities, one of which was eighteen miles from the other two, together with the fact that only one of these colonies was along a main highway, would seem to argue against the probability that it was brought in by truckers from further north. On the other hand a hundred and seventy-five miles is pretty long for a single flight and it would seem more probable that there are unknown infestations between Gainesville and Tallahassee.

—J. R. W.

STATUS OF THE FRIENDLY FUNGUS PARASITES OF ARMORED SCALE-INSECTS

E. W. BERGER
Entomologist, State Plant Board of Florida

That the friendly fungus parasites of the armored scale-insects are well established entities in their sphere of usefulness as natural agents in the control of many species was established many years ago.

It is not the intent in this brief paper to enter into any lengthy discussion of the several fungus parasites listed, but to touch mainly only upon certain points considered pertinent to the discussion.

The number of references to pertinent literature given at the end of this paper may appear small, but considering that each reference in turn gives a list of references, any critical reader who wishes to fully acquaint himself with the facts involved will find plenty of references with which to busy himself.

I shall first direct attention to Florida Experiment Station Bulletin 41 by Dr. P. H. Rolfs, published in 1897, entitled "A Fungus Disease of the San Jose Scale." This was the Red-Headed Scale-Fungus *(Sphaerostilbe cocophila)*. Revised by T. Petch as *S. aurantiicola* (1) (2). The Pink Scale-Fungus *(Nectria diploa)* (1) (2) is not treated as another distinct fungus in this paper as some mycologists believe it to be another form of the Red-Headed, and Rolfs did not make any distinction at the time he wrote Bulletin 41.

I quote the Summary as given by Dr. Rolfs in Bulletin 41:

"1. It has been established that insects are subject to diseases.

"2. Diseases of insects have been, and are being, employed to destroy insect pests.

"3. Some diseases of insect pests may be disseminated artificially with a profit.

"4. This disease of the San Jose Scale is present on at least three continents and in many countries. In several instances it is recorded as an important factor in controlling scale-insects.

"5. It is doubtless native to Florida as it occurs on a native scale *(Aspidiotus obscurus)* (revised as *Chrysomphalus obscurus* (1)) in our hammocks.

"6. This fungus may be transferred to trees affected with San Jose Scale and a disease produced among the scales.

"7. Large quantities of materials may be produced in the laboratory in a short time and at slight expense.

"8. The laboratory-grown material may be applied successfully by fruit growers.

"9. This fungus cleared the orchards more effectively of San Jose Scale than could have been done by many sprayings.

"10. It is now being tested in the North and West."

The present writer sees but little to comment upon in this summary or in other parts of Bulletin 41, which he regards as a classic in research.

It is true, insofar as the writer is aware, that laboratory produced material for planting the fungus has not been employed since Rolfs conducted his experiments. However, such material has really not been needed, since it is easy to transfer the fungus to healthy scales by merely transferring fungus material to scale-infested trees (1) (3).

As to this fungus being tested in the North and West, it has been found to overwinter there, but does not thrive sufficiently to be apparent as a control agency.

Florida Experiment Station Bulletin 94 by Dr. P. H. Rolfs and Dr. H. S. Fawcett, published in 1908, "Fungus Diseases of Scale-Insects and Whiteflies," is an excellent popular summary of the subject.

Without wishing to quote at length from this bulletin, the following lines (page 8) on the usefulness of the Red-Headed Scale-Fungus appear pertinent: "There can no longer be any question as to its efficiency in Florida, since hundreds of acres have been treated by practical orchardists, . . . "

The section on the White-Headed Scale-Fungus in Bulletin 94 is strikingly interesting, and largely bears out the writer's belief that it was this fungus that saved the citrus industry back in the 30's of the last century when the Long Scale introduced at Mandarin on some imported citrus trees was threatening the destruction of the citrus industry in Florida. Carried from Mandarin to St. Augustine, citrus trees at both places, infested with this scale, would die to the ground each year but put out new shoots each spring. Finally the trees began to recover. That it was the White-Headed Scale-Fungus is further suggested by the fact that it was the dominant scale-destroying fungus of the Long Scale and Purple Scale on citrus during the latter decades of the nineteenth century and the early decades of the twentieth. Hubbard (4) pictured it in 1885. And while, of course, the Red-Headed Scale-Fungus was present effectively controlling San Jose Scale (1), Obscure Scale, and presumably other scales including those of citrus, while the White-Headed Scale-Fungus appears not to be a native as it has never been seen on scales native to Florida, it must have come in with the Long Scale at Mandarin and had the jump on the Red-Headed which had to come from native scales to those on citrus. We may presume, of course, that it took several years for this fungus to build up to the point where it really became epidemic and began to effect sufficient control to allow the trees to recover.

As no insect parasites or other insect enemies that could account for the recovery of the citrus trees at Mandarin and St. Augustine are known, the inference remains that it was a fungus parasite, presumably the White-Headed, although the Red-Headed may have helped, that effected the control.

Another standby (1) (2) (3) of the fruit grower is the Black Scale-Fungus *(Myriangium duriaei* Mont.). The writer is not aware that the status of this fungus as an effective parasite of scale-insects has been changed in the least.

Fruit growers welcome it, but do not like the way it sticks fast to fruits when being prepared for the market.

In December, 1937, it was argued by a member before the annual meeting of The Florida Entomological Society, that because the red-headed pustules were few or at times did not appear at all on the bottoms of fungus-infected scale-infested leaves, that it was not the Red-Headed Scale-Fungus that killed the scale-insects but some other cause, the Red-Headed being a saprophyte. The same thought had only shortly before been broached by the Florida representative of a national insecticide company in a letter to the writer.

While at times it is difficult to answer or explain such surprising statements on the spur of the moment, the fact remains that Rolfs himself gave the answer (3, pages 7 and 8): "It should be said, however, that many infections occur, that are not visible to the unaided eye. It not infrequently happens, especially in the case of the San Jose Scale, that the Red-Headed Fungus kills off a very large percentage of the scales without producing any of the red pustules." Again (3, page 8): "An important fact that was brought out in the laboratory investigations, and one that is usually overlooked by those who use the hand-lens only, is that myriads of scales are infected and killed by this fungus without its being externally visible." Finally (page 8): "There can be no longer any question as to its efficacy in Florida, since hundreds of acres have been treated by practical orchardists . . . "

In a personal interview, in 1937, Dr. W. B. Tisdale, Plant Pathologist at the Florida Experiment Station, made this statement: That he has observed plenty of fungus pustules on the bottoms of leaves infested with scale, that had become inverted and exposed to stronger light.

Another outstanding instance where stronger light appears necessary to produce the fruiting bodies of a friendly fungus is the Brown Whitefly-Fungus *(Aegerita webberi)*. In this fungus the fruiting bodies are abundantly produced on the mycelium that covers the tops of the leaves, comparatively few of the fruiting bodies being produced on the shaded mycelium on the bottoms.

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EARLY WORK AND WORKERS IN SOUTHERN ENTOMOLOGY[1]

It is not my purpose to give a complete history of the development of entomology in the southern states but to sketch in brief the phases of work that occupied the early workers and particularly to touch upon the activities of some of the prominent entomologists who contributed to the growth of this branch of science.

In the South, as elsewhere in this country, the larger part of the early interest in insects was of an exploratory character and the collection and description of the conspicuous forms was much more evident than the study of the economic phases. It was, however, inevitable that some attention was given to such species as brought disaster to the early settlers. Insects which

[1]Summary of an informal talk before the Florida Entomological Society December 5, 1941, by Herbert Obsorn. This talk was illustrated by lantern slide portraits of a number of the entomologists who had a part in the development of entomological science in the South. Brief mention of the activities and personal traits of a number who were personal friends of the speaker accompanied the showing of the slides.

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attacked live stock, cotton and the citrus crops or which invaded homes and made life miserable for the occupants naturally received first attention. Accounts of raids of buffalo gnats in the early part of the last century and the invasions of the cotton leaf caterpillars long before the appearance of the boll weevil as well as accounts of the scourges of mosquitoes, various flies, fleas, ticks, chiggers and other human pests give evidence of the recognition of troublesome insect pests.

More recently the invasions of boll weevil, cottony cushion scale and the recognition of the part played in tick fever by cattle ticks, by mosquitoes in malaria and yellow fever, flies in typhoid and other diseases, figured largely in the investigations of insects in the South.

Now with the help of the lantern portraits we may consider some of the workers who have taken part in the growth of our branch of science. All but a very few, the first three, have been well known to me, many of them close personal friends and you will pardon me for the personal references.

John Abbott was one of the early students of entomology. He lived in Georgia during the 18th century and his principal work consisted in illustration of southern insects, his specimens and drawings being sent to London.

Thomas Say, often termed the "father of American entomology," did his work during the early part of the 19th century and his descriptions of American insects included a great many of the southern species so that while he may not have worked personally in the southern states he can be counted as one of the early contributors for this region.

Townsend Glover, the first entomologist of the U. S. Department of Agriculture, spent some time in Florida and probably in other southern states and his accounts seem to have centered on mosquitoes and other human pests. He also illustrated many of the economic insects of importance during his service.

C. V. Riley, for many years head of the Division of Entomology in Washington, was responsible for much work on cotton insects and the direction of work by other entomologists on southern species.

W. S. Barnard worked with Professor Riley on cotton insects and was largely responsible for the invention of the cyclone nozzle.

J. H. Comstock while entomologist of the Department of Agriculture prepared a bulletin on cotton insects and also contributed a great deal concerning scale insects, many of which are a pest of southern crops.

H. G. Hubbard lived for many years at Crescent City where he had an orange grove and did a great deal of work on orange insects and perfected the kerosene emulsion spray.

E. A. Schwartz, a special friend of Hubbard's, did a great deal of collecting in the southern states and the southwest as also in more tropical localities. He was a specialist in Coleoptera but contributed much in other groups.

W. H. Ashmead had his home in Jacksonville for many years. He collected insects of different orders and was for a time entomologist of the experiment station but his later life was spent in Washington as Curator of insects in the National Museum.

E. P. Van Duzee collected extensively in Florida and described species of Hemiptera from this region. His Catalog of Hemiptera is an indispensable work for specialists in this group.

L. O. Howard, long time entomologist of the Department of Agriculture, was largely responsible for the work of a number of southern workers and many of the prominent workers in the South had the advantage of his direction and sympathetic encouragement.

A. S. Packard, while not working individually in the South, was the author of the "Guide to the Study of Insects" which for many years was the main source of instruction for the teachers of that period.

(To be continued)