The FLORIDA ENTOMOLOGIST

Volume 40, No. 4 *December, 1957*

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Published by The Florida Entomological Society

THE FLORIDA ENTOMOLOGIST is issued quarterly—March, June, September, and December. Subscription price to non-members $3.00 per year in advance; 75 cents per copy. Entered as second class matter at the post office at Gainesville, Florida.

Manuscripts and other editorial matter should be sent to the Editor, Biology Department, University of Florida, Gainesville. Subscriptions and orders for back numbers are handled by the Business Manager, Box 2425, University Station, University of Florida, Gainesville. The Secretary can be reached at the same address.

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FOREST ENTOMOLOGY IN THE SOUTH—PAST, PRESENT, AND FUTURE [1]

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Throughout the South forest entomology is gaining recognition as an important facet of forestry, and an essential part of the forest management policies of the wood-using industries. The future of forest entomology and its progress as an applied science will depend largely upon the importance which the people of our nation place on the protection and wise use of our forest resources.

The first significant contributions to forest entomology in the United States were made in the South about 1890, shortly after the organization of entomological research in the U. S. Department of Agriculture. It was during the last decade of the 19th century that A. D. Hopkins, of the West Virginia Experiment Station, determined that the southern pine beetle, *Dendroctonus frontalis*, was responsible for the death of large volumes of pine and spruce timber in the Appalachian Mountains.

From 1902 to 1906 special attention was given to the southern pine beetle and the red and black turpentine beetles in the South Atlantic and Gulf States by W. F. Fiske, assistant to Dr. Hopkins. About 1920, Dr. M. W. Blackman, while stationed at the Mississippi Agricultural Experiment Station, conducted intensive taxonomic studies of the southern bark beetles, family Scolytidae.

At Falls Church, Virginia, from 1910 to 1924, F. C. Craighead, T. E. Snyder, and R. A. St. George initiated studies of the biology and control of various forest insects, particularly those attacking wood products, such as subterranean termites and Lyctus powder-post beetles.

Rapid strides of progress were made during the first two decades of the 20th century. During this period Hopkins accumulated sufficient information to formulate his well-known Bioclimatic Law. Through their intensive research on the biology of cerambycid beetles at Falls Church, Craighead and St. George demonstrated the validity of Hopkins' Host Selection Principle. Craighead and Snyder made many contributions to our knowledge of the role of insects associated with the spread of the chestnut blight disease, and Craighead determined the effectiveness of solar heat for killing wood borers in logs. Snyder conducted basic research on the efficacy of different methods of application of wood preservatives and of the value of naturally resistant woods in preventing subterranean termite attacks.

Federal forest insect research activities expanded with the transfer of the field laboratory from Falls Church, Virginia to the Bent Creek Experimental Forest, near Asheville, North Carolina, in 1925. Through the late 1920's and early 1930's such men as Craighead, Beal, St. George, Balch, MacAndrews, Rumbold, and Nelson, studied various aspects of the southern pine beetle problem. The life cycle of this bark beetle was determined.

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[1] This article is condensed from a talk given at the 39th Annual Meeting of the Florida Entomological Society, August 30, 1956.

The physiological effects of drought and bark beetle attacks on trees were investigated and valuable contributions were made to our knowledge of the association of blue stain fungi and yeasts in the bark beetle-infested trees.

During the late 1920's Beal studied the life history and control of the turpentine borer, *Buprestis apricans*, in the naval stores region of northeast Florida.

In the early 1930's, Craighead and St. George found that green logs could be protected from insect damage by introducing chemicals into the sap stream of standing trees prior to felling. These initial studies on tree injection at the Asheville laboratory were intensified during the mid- and late 30's by Kowal, Eaton, Wilford, and Johnston. In addition to developing several ingenious methods of tree injection, these men also conducted studies of the control of white grubs in forest tree nurseries at Camden, North Carolina, and Georgetown, South Carolina. During this period also, greater knowledge was gained on the control of subterranean termites and the preservation of rustic structures from insect damage. W. L. Baker joined the Asheville laboratory staff during the late 30's and studied the relationships of wood moisture to Lyctus powder-post beetle infestation in seasoned hardwoods.

Meanwhile, in 1935, T. E. Snyder, world authority on termites and their control, established a federal forest insect laboratory at New Orleans, Louisiana. Following Snyder's pioneering research on forest product insects, these specialized studies have been centered at the federal forest insect laboratory at Gulfport, Mississippi, since 1940.

The most noteworthy progress in forest entomology education and research in the southern institutions of higher learning came during the late 1930's when J. A. Beal initiated a forest insect curriculum for graduate students at the Duke University School of Forestry.

Present Forest Entomology in the South

During the past 50 years the vast forest reservoirs of the West have attracted many forest industries. However, as we have harvested these old-growth stands, the forest industries have begun to return to the East, and particularly to the South, where 193 million acres, or 40 percent, of the nation's commercial forest area occurs.

The intensification of forestry practices and the rapid expansion of the pulp and paper industry is already well under way in the South. With this progress has come the inevitable realization that trees from seed to harvest must be protected from the ravages of insect damage. This protection is of paramount importance if the forest industries of the South are to maintain a constant supply of raw material.

At no time up to 1950 were there more than a dozen forest entomologists in the South. Within the past five years, however, there has been a noticeable increase in the employment of forest entomologists by federal, state, and private forestry organizations; so that today there are at least two dozen professional men actively engaged in forest insect research and surveys. In the Southeast, the states of Virginia, North Carolina, Tennessee, Georgia, and Florida have recently employed men for forest insect survey, control, and extension work.

The major portion of forest insect research in the South is still being carried on by the Division of Forest Insect Research which, since the reorganization of the U. S. Department of Agriculture in 1954, has been incorporated into the Branch of Research of the U. S. Forest Service. However, very close working relationships are still maintained with the Entomology Branch of the Agricultural Research Service. During the past three years, federal appropriations and personnel for forest insect research in the South have more than doubled.

One of the big weaknesses in the South today is the lack of well-developed programs of forest entomology education and research in forestry colleges, universities, and agricultural experiment stations. The shortage of well-trained professional men in this specialized but expanding field of science is becoming more acute each year.

In recent years, the development of numerous synthetic organic insecticides has paved the way for many advancements in the control of certain forest insects in the South. DDT is still an effective insecticide for most defoliating insects such as sawflies, the forest tent caterpillar, the fall cankerworm, and others. Airplane application of this material at the rate of one pound per gallon per acre has effectively controlled some of our most serious defoliators at a cost of about one dollar per acre. Water suspensions and emulsions of DDT and BHC have been found to effectively prevent attacks of the Nantucket pine moth, *Rhyacionia frustrana,* when properly timed with moth emergence.

Benzene hexachloride has solved many of the forest insect control problems which heretofore were either unsolved or were carried on with less effective chemicals. Oil solutions of BHC are used extensively for the control and/or prevention of all the major bark beetles in the South. Water emulsion and oil solutions of BHC are also used to protect green logs and lumber from the attacks of wood borers and ambrosia beetles.

Pine reproduction weevils such as *Hylobius pales* and *Pachylobius picivorus* are causing considerable damage in the tremendous pine planting program of the South, particularly where trees are planted within one year following pine timber harvests. Several forest entomologists are currently investigating the biology and habits of these pests and are rapidly developing practical control measures which can be incorporated into the actual planting operation, such as direct control by dipping seedlings into insecticides prior to planting and indirect control by scheduling timber harvests to minimize the weevil hazard.

Chlordane and other newer chlorinated hydrocarbons and fumigants have helped solve most of the forest nursery soil-insects and nematode problems.

Intensive studies of the black turpentine beetle, *Dendroctonus terebrans,* during the past five years at the Lake City, Florida, Research Center, U. S. Forest Service, have yielded valuable information on the life cycle and habits of the bark beetle. A successful preventive and control insecticide was also developed, i.e., a one percent BHC fuel oil solution.

During the past decade, federal entomologists at the Gulfport, Mississippi, Forest Insect Laboratory have made great strides in developing more effective chemical control methods for subterranean termites, powder-post beetles, and other wood-product insects.

THE FUTURE OF FOREST ENTOMOLOGY IN THE SOUTH

Any look into the future of forest entomology in the South naturally involves considerable conjecture and speculation. However, I believe the following predictions are within the realm of possibility and realization:

1. Before the passing of another decade, most states in the South will have forest pest legislation and forest pest control personnel to enable detection and appraisal of incipient forest insect outbreaks and to permit prompt and effective control. The present upward trend in the employment of forest entomologists will continue.
2. There will be a stepped-up program of forest insect research at forestry schools, university entomology departments, and state experimental stations.
3. Large-scale cooperative aerial surveys will be made systematically and periodically for more thorough detection of outbreaks and appraisals of damage over large forested areas.
4. Emphasis will be given to basic research on all serious insect pests of forests to develop silvicultural and biological methods of control. Proper management of the stand may, for example, prevent epidemic outbreaks of bark beetles; aerial application of insect virus diseases may be used generally for control of some forest defoliators.
5. During the next ten years, considerable advancement will be made in our knowledge of the biology, ecology, and control of insects which damage the flowers, cones, and seeds of southern pines. The fast-expanding tree planting program already under way in the South, the new Soil Bank Program of the U. S. Department of Agriculture, and the establishment of superior-tree orchards mean that the need for maximum viable seed production will become increasingly acute, and the control of pine cone and seed insects will become more important.
6. Research on bark beetles will continue. However, greater emphasis will be placed on investigations of the reason for population fluctuations under various forest conditions.
7. Full-length tree spraying with ground equipment, and possibly aerial spray methods, to prevent bark beetle attacks will be developed.
8. The large areas of pure pine plantations in the South will bring with them many forest insect problems. The intensification of studies of plantation insects is already being pursued and will continue.

ESTABLISHMENT OF THE PARASITE *ANAGYRUS ANTONINAE* IN FLORIDA FOR CONTROL OF RHODESGRASS SCALE [1]

D. D. QUESTEL [2] AND W. G. GENUNG [3]

Rhodesgrass scale *Antonina graminis* (Mask.) was first reported in the United States from southern Texas in 1942. By 1950 it had been reported from 21 counties in Texas, one parish in Louisiana, and three counties in Florida (Chada and Riherd, 1950) and it has now become widespread in southern and central Florida. It attacks a number of grasses and is often a serious pest of Para, Carib, St. Augustine, and other pasture grasses. It also contributes to the unthriftiness of St. Augustine and Bermudagrass lawns and turf. Merrill (1953) reported that the species has become of economic importance on lawns and golf greens and Kelsheimer and Kerr (1957) stated that it is the most widely damaging of the grass scales in Florida. Some ranchers in the Everglades area have complained of considerable loss from this scale.

Since Rhodesgrass scale could not be economically controlled in pastures with insecticides, parasites were introduced in 1954. In July the senior author released 800 parasites, *Anagyrus antoninae* Timberlake, near Clewiston, Florida, for control of this scale. The wasps were reared by and received from Herbert A. Dean of the Texas Agricultural Experiment Station and the USDA Agricultural Research Service, Weslaco, Texas. The original release was made on Paragrass heavily infested with this scale, after collections had shown that this parasite was not already in the area.

The initial introduction at Clewiston was comprised of free-living adults, but subsequent releases were made by placing stems of grasses infested with parasitized scales about infested pastures. The parasites then emerge into a suitable environment. Under this method parasite mortality is probably much lighter than where previously reared and handled adults are released. The parasitized material should be placed near fence rows, ditches, or in other protected situations where excessive grazing has not occurred.

To ascertain if the parasite introduction was successful, host grass from the vicinity of the release point was collected. Samples were taken from several spots to make a composite sample, which was placed in a cardboard box and sealed tightly. Test tubes containing alcohol were inserted into two or three holes that had been made in one side of each box, and slanted slightly downward. A positive phototropic response caused the emerging adult parasites to move toward the light, and they were thus trapped in the tubes containing alcohol.

In the summer of 1956 a survey was made to determine the dispersal and concentration of population at various distances from the releases made in 1954. Less than one pound of scale-infested Paragrass was collected

[1] Florida Agricultural Experiment Station Journal Series, No. 632.

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from each location. The numbers of parasites recovered from the various collections and dates of their emergences are shown below.

Collections on July 9 east of release points, and emergence dates

Miles	July 16	July 19	July 23	July 26	July 30	Aug. 1	Aug. 10	Total
3	1	2	12	15	11	1	18	60
4	0	4	10	8	21	5	21	69
5½	0	0	0	0	3	0	3	6
7	0	0	0	4	17	6	2	29
7½	0	0	0	0	2	0	3	5

Collections on July 24 west of release points, and emergence dates

Miles	July 26	July 30	Aug. 1	Aug. 10	Total
2	4	45	30	41	120
3	11	37	2	36	86
5½	0	0	0	5	5

Collections on August 15 north of release points, and emergence dates

Miles	Aug. 20	Aug. 27	Sept. 4	Total
1½	9	67	224	300
3	0	6	17	23
4	0	2	7	9
5½	0	4	9	13

No collections were made south of the points of liberation, as this area was raw, unfarmed land mostly devoid of host grasses. In the area where the first liberations were made it is now difficult to find Rhodesgrass scales.

Recently the authors have attempted to meet the requests of ranchers in southern Florida for the wasps to control infestations of the scale. These releases have been followed up to determine if the parasites became established.

On October 18, 1956, four paper cartons (each 1½ cubic feet) were filled with scale-infested Paragrass. This grass, collected near Clewiston, was infested with scale heavily parasitized by *Anagyrus antoninae*. Two of the cartons were taken to the Veryl Ranch, 10 miles south of South Bay and 30 miles from any points where liberations had been made previously, and two to a ranch 20 miles west of Stuart. The parasite-bearing grass was scattered among heavily infested pastures. On December 11, 1956, two boxes of scale-infested grass were collected for parasite recovery at the Veryl Ranch. On December 12 a single *Anagyrus* emerged and by December 31, eighty-nine of these parasites had emerged. On February 7, 1957,

collections were made on the ranch west of Stuart where releases had been made in October in the Paragrass pasture. Numerous parasites emerged from this material.

On March 1, 1957, the junior author made releases of *Anagyrus* on scale-infested Paragrass near Lake Worth. From a collection near the release point made on June 6 a single parasite emerged after a few hours and subsequently many wasps emerged.

On June 25, 1957, a small amount of infested grass was collected at Pahokee for the purpose of recovering some other recently released parasites that attack the Rhodesgrass scale. None of these parasites were recovered, but more than 100 *Anagyrus antoninae* were recovered. These grass samples were collected 20 miles from where *Anagyrus antoninae* had been released.

These observations show that the parasite has spread over an area several miles east, north, and west of the points of liberation. In addition, introductions on ranches in widely separated areas have resulted in successful establishment of the wasps. At the place of initial liberation it is now difficult to find Rhodesgrass scale. No release has failed to result in establishment of the parasites. The continued dissemination of *Anagyrus antoninae* should help solve the Rhodesgrass scale problem in southern Florida.

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CLARIFICATION OF THE SPECIES IN THE GENUS *DENDROTETTIX* (ORTHOPTERA: ACRIDIDAE, CYRTACANTHACRINAE)[1]

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For half a century, the exact status of the species in the Orthopteran genus *Dendrotettix*, other than the genotype, has been very confused. Caudell (1915) has reviewed the history of this generic name, while Rehn and Rehn (1936) have very clearly stated the nomenclatorial history of the species in the genus. Although those interested are referred to these publications for details, a brief resume of this past record is given here for a clearer understanding of the discussions which follow.

In 1861, Saussure, in France, described *Pezotettix zimmermanni* from a single female specimen sent to him by a Dr. Christian Zimmermann who spent considerable time in both North and South Carolina. One cannot at all be sure from where this specimen came, since Saussure's locality description merely designates "Carolina". The label accompanying the type, however, reads "Carol. S.". From what is now known of the habits and distribution of this species, and if it was collected by Zimmermann, it certainly came from the mountainous regions of northwestern South Carolina. The possibility also exists, of course, that Zimmermann received the specimen from some collector and, in turn, sent it to Saussure. This holotypic female has been dried from alcohol with the result that it is discolored, the tegmina are curled and the abdomen shriveled. It now resides in the Museum d'Histoire Naturelle in Geneva, Switzerland, labelled as "*Melanoplus zimmermanni,* Carol. S., Type/Saussure."[2]

A. P. Morse, during the time he was collecting Orthoptera in the southeastern region of the United States some fifty years ago, secured a single female melanoploid from the summit of Cheaha Mountain, Alabama, which he described (1906) as *Podisma scudderi.* He changed this name (1907) to *Podisma australis* because of the earlier use of *Podisma scudderi* (Walker, 1870) for the species now known as *Melanoplus scudderi.*

Between the periods of these two descriptions, Packard (1890) described a new genus *Dendrotettix* with *D. quercus* as the genotype. The subsequent examinations by various investigators of the types of both Saussure's *Pezotettix zimmermanni* and Morse's *Podisma australis* indicated their inclusion in *Dendrotettix* rather than their original placement.

Blatchley (1920), who correctly placed Morse's species in the genus *Dendrotettix,* erroneously described as a male of that species a specimen taken near White Sulphur Springs, West Virginia. This has been shown by Rehn and Rehn (1936) to be a specimen of *Appalachia hebardi.* However, as will be shown on the following pages, these authors, in the same publication, made an error in concluding that Morse's species was a synonym of Saussure's.

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[1] Field work for this paper aided in part by a Margaret Cannon Howell grant from the Highlands Biological Station, Highlands, North Carolina.

[2] According to Ch. Ferriere, Conservateur pour l'entomologie, Geneva Museum, *in litt.*

Hebard (1936) described *Dendrotettix hesperus* as a new species from the western ridges of the Cascade Mountains in central Oregon. Here again, the species was founded upon a single female. Rehn and Rehn (1939) reassigned this species to the genus *Podisma.*

T. H. Hubbell (1938, footnote 2) revealed the presence of two males of what he called *Dendrotettix zimmermanni* in the collections of the University of Michigan Museum of Zoology which he had collected at Allardt, Fentress County, Tennessee. These first recorded males of a *Dendrotettix* (now known to be *D. australis*), other than those of *D. quercus*, were thought by Rehn and Rehn (1939) to represent a distinct form not belonging to the genus *Dendrotettix.*

In 1939, then, the genus *Dendrotettix* contained the well-founded species *Dendrotettix quercus* along with *Dendrotettix zimmermanni* which was known from the record of the unique female type, a female from Pinnacle Mountain, South Carolina collected by Franklin Sherman and recorded by Rehn and Rehn (1936), and the supposed males of this species recorded by Hubbell (1938). *Dendrotettix australis*, known only from the record of the unique female type, was placed in synonomy with *zimmermanni.* Thus has the matter remained until this date.

Since 1939, numerous trips have been made at various times to Cheaha Mountain, Alabama by T. H. Hubbell, I. J. Cantrall, H. K. Wallace and the author for the purpose of collecting *Dendrotettix.* Although a few females were obtained on these excursions, it was not until M. J. D. White, formerly of the University of Texas, while attempting to collect specimens of *Dendrotettix* on Cheaha Mountain for cytological studies, made the discovery in 1952 that they live almost exclusively upon *Pinus virginiana.* Since then, the search for these orthopterans has been more lucrative, and a series of males and females has been obtained. It should be stated, however, that their cryptic coloration makes them extremely difficult to find, and the relatively small series now in my collection has been gained only by the examination of a very large number of pines. Besides the Cheaha specimens, a single male of *Dendrotettix*, identical with those from Cheaha, was collected from undergrowth near the Wilson Lick Ranger Station on Wayah Mountain, Macon County, North Carolina.

During the late summer of 1948, while collecting on the tops of the mountains around Highlands, North Carolina, I secured two males which were recognized immediately to belong to the genus *Dendrotettix.* Close examination showed them to be very different from the males taken at Cheaha Mountain, Alabama and the male from Wayah Mountain, North Carolina. More recently, we have discovered that this *Dendrotettix* lives on the oak, *Quercus rubra*, variety *borealis* on the higher mountains of the southern Appalachians, and a small series of both males and females of this species has been collected.

A comparative examination was completed during 1954 of all the available specimens of *Dendrotettix.* In addition to specimens in my own collection, these included those in the collection of the University of Michigan Museum of Zoology, those at the Philadelphia Academy of Sciences, Morse's type of *Podisma* (= *Dendrotettix*) *australis* in the Museum of Comparative Zoology, Harvard University, and the female taken by Franklin Sherman on Pinnacle Mountain, South Carolina and now in the collections of the

United States National Museum. This examination clearly revealed the fact that there were at least two valid species in the genus in addition to the genotype, *Dendrotettix quercus*. Two alternatives suggested themselves. Either Morse's *australis* was a valid species and not a synonym of *zimmermanni*, or a new species of *Dendrotettix* was at hand. The possibility that Saussure's type differed from the two species in the collections seemed less likely. To check the first alternative, female specimens from Cheaha Mountain, Alabama, and Highlands, North Carolina were sent to Dr. Ch. Ferriere at the Geneva Museum along with a description of characters which had been found to separate the two. Dr. Ferriere has been very gracious in carefully comparing these specimens with Saussure's type of *zimmermanni*. A letter from him states (parenthetical statements my own), "The specimen (Saussure's type) is light brown, with the abdomen somewhat shrivelled, owing probably to its conservation in alcohol when being sent to Saussure. Otherwise it agrees well with your specimen from North Carolina. The ventral ovipositor is a little broader than in your specimen and more curved below, but is without a sharp angle. I am of the opinion that Saussure's type and the specimen you have called *Dendrotettix zimmermanni* (the specimen from Highlands, North Carolia) are the same species, which differ distinctly, by the characters you indicated, from the specimen of *Dendrotettix australis* (the specimen from Cheaha Mountain, Alabama)". Upon the basis of Ferriere's observations, along with certain sketches of Saussure's type which he sent to me and which appear to substantiate his statements, it seems certain that the *Dendrotettix* from the Highlands region, and certain other specimens indicated later, is *Dendrotettix zimmermanni*. Further, it is now perfectly clear that *australis* differs considerably from *D. zimmermanni* and is truly a valid species. The possession of males of both species and their very definite distinctions establishes this fact beyond any doubt. Critical examination of the females also has revealed good characters separating these species.

Keys to the Species of Dendrotettix

Males

1. Tegmina abbreviate or fully developed; when abbreviate, with very distinct humeral and discoidal veins which curve dorsally at the distal extremity (fig. 2). Head and pronotum more inflated, with greatest width of head across genae 3.8-4.5 mm; interocular distance averaging greater (0.95 mm); pronotum with distinct lateral angles on metazona between disk and lateral lobes (fig. 9). Furculae relatively short, trigonal, pointed to narrowly rounded at the tip (fig. 1). Cerci bulbous at the base but flattened in a horizontal plane distally (fig. 1). Concealed genitalia distinctive, as shown in fig. 3 ..... *quercus* Packard

   Tegmina abbreviate only; humeral and discoidal veins not so distinct, nearly straight, and not curved dorsally near the apex (fig. 7). Head and pronotum less inflated, greatest head width across genae usually less than 3.8 mm; interocular distance averaging less than 0.95 mm; pronotum with disk rounding into lateral lobes with less distinct angles on the metazona (figs. 12 and 15). Furculae longer, broader, trigonal or more broadly rounded at tip (figs. 4 and 6). Cerci resembling those of *quercus* for the greater part of their length, but compressed at the tip in a vertical plane beyond the horizontal flattening (figs. 4 and 6). Concealed genitalia as shown in figs. 5 and 8 2

2. Averaging larger in all characters (Table 1); total body length greater than 20 mm; pronotum more than 4 mm long. General coloration darker; hind femora with cherry red on inner and outer faces. Supra-anal plate nearly or quite as broad as long, the lateral margins generally evenly arcuate; furculae longer, trigonal, and very broad at the base (fig. 6). Concealed genitalia as shown in fig. 8 ..... *australis* (Morse)

   Averaging smaller in all characters (Table 1); total body length less than 20 mm; pronotum less than 4 mm long. General coloration lighter; hind femora without cherry red on inner and outer faces. Supra-anal plate longer than broad, the lateral margins more sinuate; furculae shorter, trigonal to rounded at the tips and very much narrower at the base than in *australis* (fig. 4). Concealed genitalia as in fig. 5 ..... *zimmermanni* (Saussure)

FEMALES

1. Tegmina abbreviate or fully developed; when abbreviate, with very distinct humeral and discoidal veins which curve dorsally at the distal extremity (fig. 2). Head and pronotum more inflated, with greatest head width across genae nearly or greater than 5 mm; interocular distance averaging 1.4 mm; pronotum with distinct lateral angles on metazona between disk and lateral lobes; metazonal disk more coarsely cribrose-punctate (fig. 9). Dorsal ovipositor valves shorter and wider, not at all compressed, and ultimate sternite rectangulate to obtuse angulate caudally (fig. 11) ..... *quercus* Packard

   Tegmina abbreviate only; humeral and discoidal veins not so distinct, nearly straight, and not curved dorsally near the apex (fig. 7). Head and pronotum narrower, less inflated, with greatest head width across genae less than 4.5 mm; interocular distance averaging less than 1.4 mm; pronotum with disk rounding into lateral lobes without distinct angles on the metazona; metazonal disk finely impressed cribroso-punctulate (fig. 15). Dorsal ovipositor valves longer and narrower, subcompressed, and ultimate sternite acute angulate to rectangulate or else truncate to broadly rounded caudally (figs. 14 and 17) 2

2. Larger and more robust (Table 1). General coloration darker; hind femora with cherry red on inner and outer faces. Pronotum with prozona more inflated dorsally; only the principal transverse sulcus impressed across the mid-dorsal line, the other two sulci usually represented only by shallow impressions laterally on the disk of the prozona and not crossing the mid-dorsal line (fig. 15). Ventral ovipositor valves shorter, heavier, and with a sharp angle ventrally, when seen in lateral view, where the tip of the ovipositor joins the shaft as shown at point *b* in fig. 16. Ultimate sternite caudally truncate to broadly rounded (fig. 17) ..... *australis* (Morse)

   Somewhat smaller and more slender (Table 1). General coloration lighter; hind femora without cherry red on inner and outer faces. Pronotum with prozona less inflated dorsally; all three transverse sulci deeply impressed across the mid-dorsal line (fig. 12). Ventral ovipositor valves more attenuate, rounding ventrally, when seen in lateral view, where the tip joins the shaft as shown at point *a* in fig. 13. Ultimate sternite acute angled to rectangulate caudally (fig. 14) ..... *zimmermanni* (Saussure)

Dendrotettix quercus Packard

This species has been adequately described by Scudder (1897) and Blatchley (1920), and other important remarks concerning diagnosis, nomenclatorial history, distribution, bionomics, and micropterism are to be found

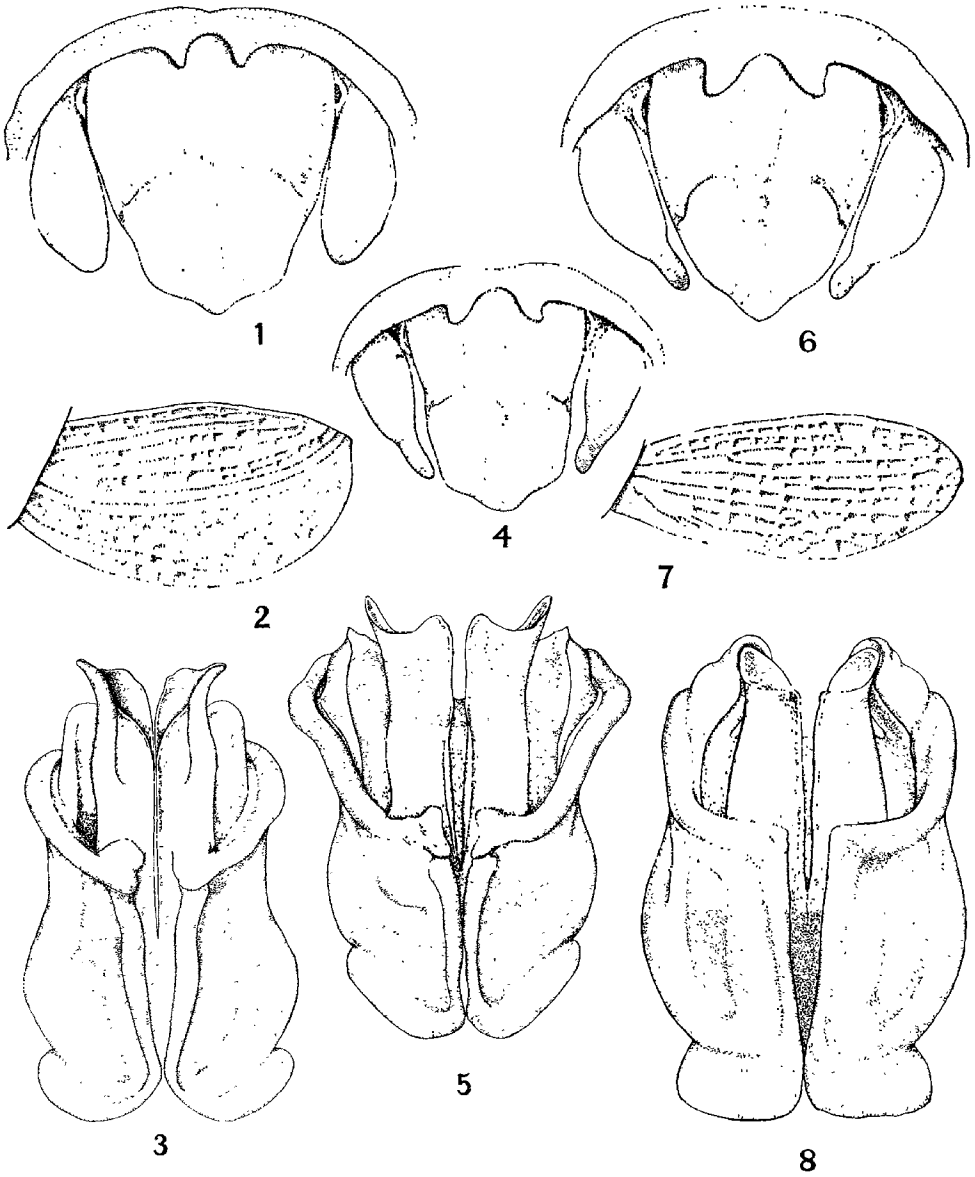
TABLE 1.

THE RANGE AND AVERAGE COMPARATIVE MEASUREMENTS, IN MILLIMETERS, FOR ALL MALE AND FEMALE *Dendrotettix* EXAMINED.

	Dendrotettix quercus		*Dendrotettix australis*		*Dendrotettix zimmermanni*	
Males	Range	Av.	Range	Av.	Range	Av.
Greatest width head	3.82 - 4.54	4.04	3.42 - 3.82	3.57	3.06 - 3.24	3.13
Interocular distance	0.86 - 1.01	0.95	0.72 - 0.86	0.78	0.61 - 0.79	0.68
Length of eye	1.90 - 2.16	1.97	1.91 - 2.27	2.19	1.69 - 2.02	1.82
Width of eye	1.62 - 1,87	1.64	1.62 - 1.73	1.66	1.48 - 1.62	1.54
Length of pronotum	4.39 - 5.40	4.69	4.43 - 4.93	4.66	3.60 - 3.89	3.77
Length prozona	2.52 - 3.02	2.70	2.66 - 3.06	2.83	2.30 - 2.38	2.36
Length metazona	1.73 - 2.38	2.13	1.62 - 1.94	1.83	1.30 - 1.51	1.42
Length front femur	3.82 - 4.82	4.19	3.89 - 4.46	4.13	3.53 - 3.85	3.63
Length middle femur	3.82 - 4.83	4.23	4.03 - 4.54	4.26	3.67 - 3.89	3.73
Length hind femur	10.66 - 13.46	11.57	9.94 - 11.98	10.89	9.50 - 9.94	9.69
Width hind femur	1.98 - 2.88	2.40	2.30 - 2.52	2.39	2.05 - 2.23	2.12
Length supra-anal plate	1.80 - 1.94	1.90	1.62 - 1.94	1.84	1.51 - 1.55	1.53
Width supra-anal plate	1.51 - 1.87	1.72	1.66 - 1.84	1.72	1.37 - 1.44	1.39
Females						
Greatest width head	4.97 - 5.37	5.22	4.14 - 4.18	4.16	3.89 - 4.18	4.04
Interocular distance	1.30 - 1.58	1.44	1.04 - 1.22	1.14	0.97 - 1.17	1.04
Length of eye	2.09 - 2.30	2.18	2.16 - 2.38	2.28	2.02 - 2.16	2.07
Width of eye	1.73 - 1.94	1.80	1.62 - 1.73	1.68	1.62 - 1.69	1.64
Length of pronotum	5.54 - 7.13	6.35	5.36 - 6.01	5.79	4.97 - 5.54	5.25
Length prozona	3.02 - 3.96	3.45	3.02 - 3.60	3.40	2.88 - 3.28	3.09
Length metazona	2.52 - 3.31	2.91	2.27 - 2.45	2.39	2.09 - 2.27	2.16
Length front femur	4.07 - 5.26	4.59	3.74 - 4.14	3.93	3.71 - 4.18	3.91
Length middle femur	4.21 - 5.40	4.71	4.03 - 4.50	4.17	3.96 - 4.46	4.14
Length hind femur	12.71 - 16.13	13.99	11.92 - 13.32	12.64	12.38 - 12.96	12.53
Width hind femur	2.52 - 3.35	2.87	2.52 - 2.74	2.65	2.38 - 2.56	2.49

in the publications of Rehn and Rehn (1936, 1938, 1939) and J. A. G. Rehn (1946).

Individuals of the macropterous phase of *D. quercus* are, of course, easily separated from individuals of *D. australis* and *D. zimmermanni* which always have the wings and tegmina abbreviate. Brachypterous forms of *D. quercus* are almost as easily distinguished by the other characters given in the keys. These include the much more inflated head and pronotum, the distinct lateral angles on the metazonal shoulders and the course punctations of the metazonal disk, the distinct humeral and discoidal veins which curve dorsally at the distal end of the tegmina, the relatively short furculae, and the male cerci which are flattened in a horizontal plane distally and



never compressed in a vertical plane beyond the horizontal flattening as in *D. australis* and *D. zimmermanni.* The concealed male genitalia of *D. quercus* also are very distinct from those of the other two species.

DISTRIBUTION: Rehn and Rehn (1936) indicate the distribution of this species to be "From east-central Texas (Travis and Washington Counties) eastward across southeastern Kansas, Missouri, southern Iowa to as far as northeastern Illinois (Crete). Also occurring, possibly as an accidental introduction in southern and south-central New Jersey and central Long Island, New York". Specimens from the following additional localities have been examined and, to my knowledge, have not been recorded previously. MICHIGAN: 7 miles north Detroit, Wayne County, near shore of Lake St. Clair, Aug. 7, 1938, 1 male, 1 female (both brachypterous), G. W. Rawson (Univ. Mich., Mus. Zool.). CANADA: Turkey Point, Ontario, Aug. 25, 1940, 1 female, F. A. Urquhart (Acad. Nat. Sci. Phila.). TENNESSEE: Allardt, Fentress County, Aug. 7, 1924, 1 female; Aug. 11, 1924, 2 males; Sept. 6, 1924, 2 females; T. H. Hubbell (Univ. Mich., Mus. Zool.).

The Michigan and southern Ontario records and the southeastern extension of the known range into Tennessee would seem to corroborate the opinion of Rehn and Rehn (1936, footnote 33, page 21) that the New Jersey and New York colonies of this species are not due to accidental introduction. It is probable that in the eastern United States *D. quercus* will eventually be found in suitable areas in Indiana and Ohio, the Allegheny regions of Pennsylvania and West Virginia, and southwestward throughout the Cumberland Plateau regions of Kentucky, Tennessee, and northeastern Alabama.

Dendrotettix australis (Morse)

DESCRIPTION OF PLESIALLOTYPE MALE: Alabama, Cleburne Co., Mt. Cheaha, July 10-11, 1953 (J. J. Friauf).

Head with width across eyes, in front view, greater than across genae; appreciably swollen laterally and dorsally beyond anterior margins of prono-

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Fig. 1. *Dendrotettix quercus.* Male. Mt. Misery, Burlington Co., New Jersey. Dorsal view of supra-anal plate, furculae, and cerci. (Greatly enlarged).

Fig. 2. *Dendrotettix quercus.* Male. Mt. Misery, Burlington Co., New Jersey. Left tegmen. (Greatly enlarged).

Fig. 3. *Dendrotettix quercus.* Male. Mt. Misery, Burlington Co., New Jersey. Caudal view of penis. (Greatly enlarged).

Fig. 4. *Dendrotettix zimmermanni.* Plesiallotype male. Satulah Mountain south of Highlands, Macon Co., North Carolina. Dorsal view of supra-anal plate, furculae, and cerci. (Same scale as fig. 1).

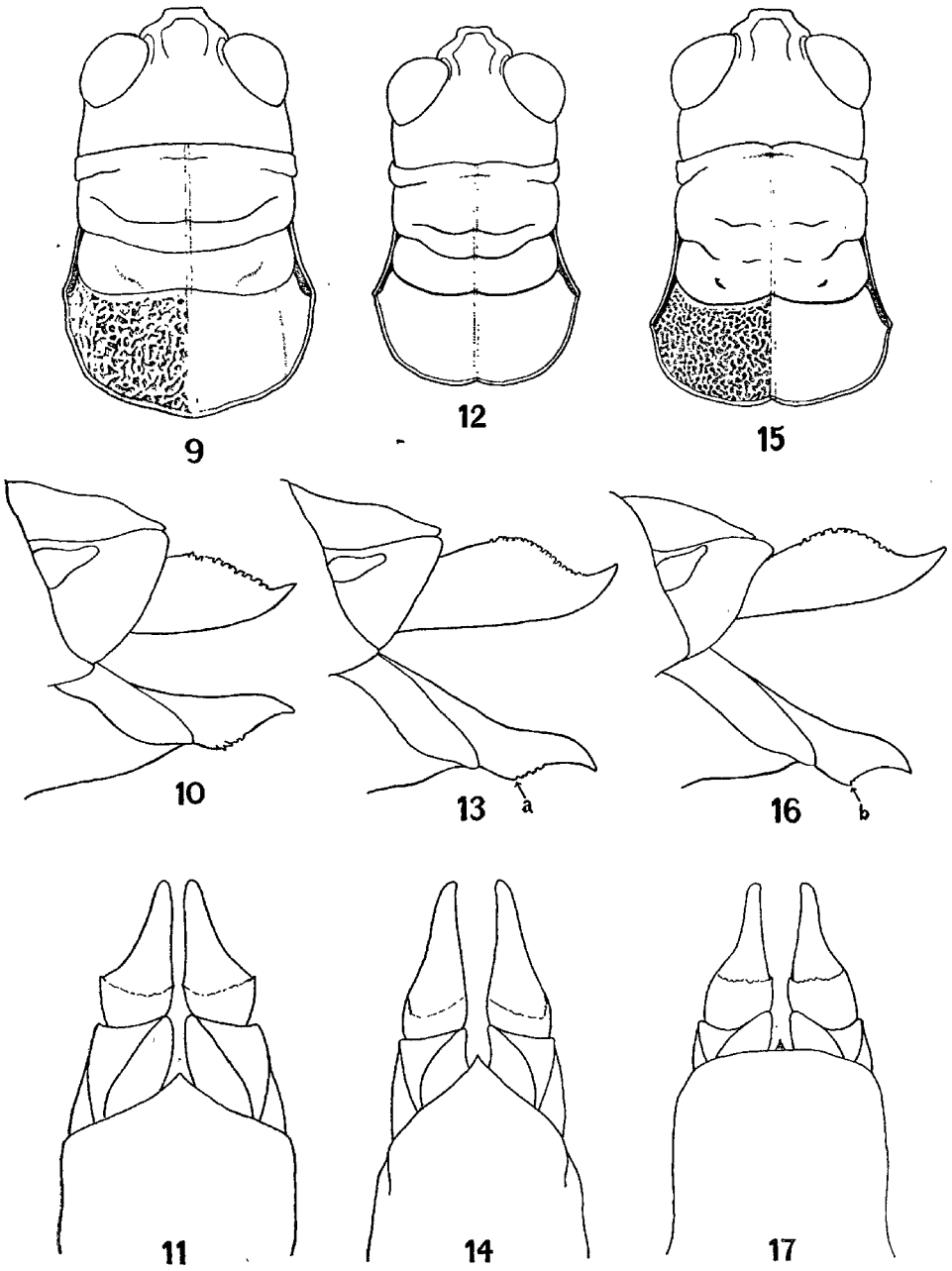
Fig. 5. *Dendrotettix zimmermanni.* Plesiallotype male. Satulah Mountain south of Highlands, Macon Co., North Carolina. Caudal view of penis. (Same scale as fig. 3).

Fig. 6. *Dendrotettix australis.* Plesiallotype male. Mt. Cheaha, Cleburne Co., Alabama. Dorsal view of supra-anal plate, furculae, and cerci. (Same scale as figs. 1 and 4).

Fig. 7. *Dendrotettix zimmermanni.* Male. Yellow Mountain north of Highlands, Macon Co., North Carolina. Left tegmen. (Same scale as fig. 2).

Fig. 8. *Dendrotettix australis.* Plesiallotype male. Mt. Cheaha, Cleburne Co., Alabama. Caudal view of penis. (Same scale as figs. 3 and 5).

tum; fastigium declivent, extending in front of the eyes for a distance approximately two-thirds the least interocular distance; disk of fastigium wholly but shallowly concave, with margins raised to a greater extent immediately in front of eyes; juncture with frontal costa transversely truncate and in width approximately one-half that of the interocular distance; frontal costa widest between the antennal bases, slightly convergent above and below this region and subparallel below the median ocellus; moderately sulcate for the entire length, the sulcation being greatest above the median



ocellus. Eyes prominent, broadly ovate and slightly flattened dorsally, posterior border much more convex than anterior border. Antenae 12 millimeters in length, composed of 25 segments.

Pronotum, in lateral aspect, feebly and broadly convex on prozona, somewhat more convex on metazona (nearly straight to slightly convex throughout entire length of pronotum in other specimens examined); cephalic margin flaring slightly to receive the swollen head; dorsum of prozona evenly arched and rounding laterad into the vertical lateral lobes; metazona weakly tectate with lateral shoulders clearly evident but not prominent; cephalic margin of pronotal disk, in dorsal aspect, broadly arcuate with only a trace of a median emargination; caudal margin of disk somewhat more arcuate than cephalic margin and with no median emargination (showing a shallow and broader emargination in some specimens); median carina more prominent on metazona than on prozona; prozona 2.88 mm and metazona 1.94 mm in length; transverse sulci of prozona shallower than principal sulcus, the posterior prozonal sulcus incomplete on lateral portions of disk (this latter sulcus complete but less distinct than anterior prozonal sulcus in some specimens); depth of pronotum from carina to ventralmost margin, in lateral aspect, 3.46 mm; cephalic margin of lateral lobes weakly sinuate, ventro-cephalic angle obtusely rounding into the broadly concave cephalic emargination of the ventral margin, median portion of ventral margin evenly rounded obtuse, and caudal portion of ventral margin weakly sinuate; caudal margin of lateral lobes straight, ascending obliquely, passing evenly into caudal margin of disk.

Tegmina elongate-ovate, with dorsal (posterior) border much less convex than ventral (anterior) border; tegminal length 4.18 mm, surpassing the

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Fig. 9. *Dendrotettix quercus.* Female. Allardt, Fentress Co., Tennessee. Dorsal view of head and pronotum. (Greatly enlarged).

Fig. 10. *Dendrotettix quercus.* Female. Allardt, Fentress Co., Tennessee. Lateral view of apex of abdomen, showing dorsal and ventral ovipositor valves. (Greatly enlarged).

Fig. 11. *Dendrotettix quercus.* Female. Allardt, Fentress Co., Tennessee. Ventral view of ultimate sternite and ventral ovipositor valves. (Not to same scale as Fig. 10).

Fig. 12. *Dendrotettix zimmermanni.* Female. Yellow Mountain north of Highlands, Macon Co., North Carolina. Dorsal view of head and pronotum. (Same scale as fig. 9).

Fig. 13. *Dendrotettix zimmermanni.* Female. Yellow Mountain north of Highlands, Macon Co., North Carolina. Lateral view of apex of abdomen, showing dorsal and ventral ovipositor valves. (Same scale as fig. 10).

Fig. 14. *Dendrotettix zimmermanni.* Female. Yellow Mountain north of Highlands, Macon Co., North Carolina. Ventral view of ultimate sternite and ventral ovipositor valves. (Same scale as fig. 11).

Fig. 15. *Dendrotettix australis.* Female. Mt. Cheaha, Cleburne Co., Alabama. Dorsal view of head and pronotum. (Same scale as figs. 9 and 12).

Fig. 16. *Dendrotettix australis.* Female. Mt. Cheaha, Cleburne Co., Alabama. Lateral view of apex of abdomen, showing dorsal and ventral ovipositor valves. (Same scale as figs. 10 and 13).

Fig. 17. *Dendrotettix australis.* Female. Mt. Cheaha, Cleburne Co., Alabama. Ventral view of ultimate sternite and ventral ovipositor valves. (Same scale as figs. 11 and 14).

caudal margin of the first abdominal tergite by approximately one-third the length of that segment; width of tegmina 2.09 mm; humeral trunk veins not forming a distinct parallel grouping as in *Dendrotettix quercus* (compare figs. 2 and 7); tegmina separated dorsally by a distance of 1.58 mm.

Cephalic and middle femora equally stout; cephalic femora 4.07 mm, middle femora 4.32 mm, and caudal femora 11.08 mm in length; caudal tibiae with 9-10 external, 11 internal spines.

Ultimate tergite (supra-anal plate) approximately as broad as long (length 1.83 mm, width at base 1.73 mm), the lateral margins evenly arcuate to near the tip; furculae trigonal and very broad at their bases; cerci resembling those of *D. quercus* for the basal three-fourths of their length but with the distal end compressed in a vertical plane beyond the horizontal flattening (fig. 6).

Concealed genital structures distinctive in caudal aspect as indicated in fig. 8.

COLORATION OF MALE: Front of head, sides of head below postocular stripe, lower margin of pronotum and ventral side of abdominal tergites pale buff to olive gray, mottled variously with a deeper olive. Area between eyes and disk of vertex fuscous, margins of vertex a darker brown; occipital region with a median triangular area of similar dark brown bordered laterally by paler stripes; eyes cinnamon brown, irregularly mottled with darker brown; basal 4-5 segments of antennae of same general color as frons, distally becoming increasingly more reddish brown; postocular bar dark mummy brown, its dorsal edge running antero-dorsally above the postero-mesial border of the eye.

Pronotum with disk of prozona buff to olive gray; metazonal disk much darker because the base color of the prozona is suffused with brown; median carina dark brown and of about the same color as dark stripe on lateral lobes; continuation of postocular stripe on upper margin of lateral lobes chocolate brown dorsally and darker along ventral half of stripe; area of lateral lobes below postocular band ivory to buff.

Tegmina of approximately the same color as metazonal disk, veins lighter in color than cells.

Dorsal median stripe of abdomen olive to olive gray mottled with brownish spots; lateral dark stripes extend caudad to base of seventh tergite, then are not so clearly evident on the seventh and eighth tergites, and again present on the ninth; color of lateral stripes blackish brown, interrupted along the distal margin of each abdominal segment by a dorsal extension of the buff color of the ventral portions of the tergites. Supra-anal plate pale medially, with wide marginal bands of blackish brown from the base almost to the tip; furculae of same color as marginal bands; cerci olive gray, darkening to brown or black at their apices. Venter of thorax and abdomen light greenish yellow, and last three abdominal segments ventrally with a pinkish suffusion.

Cephalic and middle legs bright yellow green in life; inner and outer faces of caudal femora, except at base and distally, cherry red; dorsal surface and lateral face of hind femora crossed by four brownish bands, one proximal, one premedian, one postmedian, and one distal; ventral sulcus of hind femora greenish yellow with reddish suffusion. Caudal tibiae glaucous, tibial spines black-tipped.

FEMALE: Although Morse's original description of the female type of this species is fairly adequate, it is supplemented below by additional observations based upon topotypic material collected on Cheaha Mountain, Cleburne Co., Alabama.

Similar to the male except as indicated in the following remarks. Size larger and more robust. Head with genae and dorsum more tumid; fastigium somewhat more declivent; frontal costa (three-fourths of specimens examined) with much less sulcation near dorsal end where frontal costa joins fastigium. Eyes less prominent and averaging proportionately longer in comparison with the width than in the male. Antennae 11.5 mm long on the average and composed of 25 segments.

Pronotum more tumid on prozona and more flaring laterally on the metazona than in the male; caudal margin less arcuate. Transverse sulci of prozona represented only by shallow impressions laterally on the disk and not crossing the median carina (although there is considerable variation in the extent and depth of the prozonal sulcations, in no specimen examined are they as prominent as these sulcations in females of *D. zimmermanni*); disk of metazona rounding into lateral lobes with little or no indication of lateral shoulders.

Cephalic femora somewhat stouter than middle femora.

Abdominal segments tectate and median dorsal carina much more conspicuous than in the male, especially on the posterior segments.

COLORATION OF FEMALE: Dorsum darker and more mottled olivaceous gray and brown, without the contrasting lighter markings of the male.

Front of head darker grayish green mottled with brown; occipital region usually without as distinct a median triangular area bordered laterally by paler stripes.

Pronotum with entire disk dark brown, with only faint indications laterally of the olive gray color so conspicuous on the prozonal disk of the male.

Tegmina and legs as in the male.

Abdomen lacking the contrasted lighter median stripe and lateral dark stripes of the male; dorsum darker, with brown mottling of the olive gray base. Venter of thorax and abdomen generally buffy brown.

DISTRIBUTION: All of the known specimens of *Dendrotettix australis* have been examined from the following localities: NORTH CAROLINA: Macon Co., Wayah Mountain west of Franklin, Nantahala National Forest, Aug. 16, 1947 (J. J. Friauf), 1 male. TENNESSEE: Allardt, Fentress Co., Aug. 18-Sept. 6, 1924 (T. H. Hubbell), 1 male, 2 females. This male, along with another which was not seen, was recorded by Hubbell (1938, footnote 2) as *Dendrotettix zimmermanni.* ALABAMA: all Alabama specimens are from Mt. Cheaha, Cleburne Co., as follows: July 5, 1939, (J. J. Friauf), 1 female; Sept. 9, 1946 (T. H. Hubbell, I. J. Cantrall, H. K. Wallace), 1 male, 3 females; Aug. 19, 1951 (I. J. Cantrall), 1 female (all of the above Alabama specimens in the Univ. Mich. Mus. Zool.); June 30-July 1, 1952 (M. J. D. White and J. C. White), 2 males, 2 females (Acad. Nat. Sci. Phila.); July 10-11, 1953 (J. J. Friauf), 6 males, 10 females; July 15, 1955 (J. J. Friauf), 4 males, 5 females.

As stated previously, this species is found almost exclusively upon *Pinus virginiana,* although scattered individuals may be found on lower

shrubbery. When more thorough collecting has been done, this species will probably be found to occur on this pine throughout the Cumberland Plateau region of Kentucky, Tennessee, and northeastern Alabama and eastward in the southern Appalachians at lower elevations wherever large stands of *Pinus virginiana* occur. The male obtained on Wayah Mountain, North Carolina was found beneath such pines at approximately 3,000 feet elevation around the Wilson Lick Ranger Station.

Dendrotettix zimmermanni (Saussure)

Both sexes of this species are readily distinguished from those of the closely allied *D. australis* by their over-all lighter coloration and by the coloration of the caudal femora, which ventrally and internally are yellowish green and lack the cherry red coloration found in *australis*. This species also is distinguished by its smaller and much less robust size, especially in the males. As indicated in the keys to the species, males are separated from those of *australis* by the shape of the supra-anal plate and furculae and the form of the concealed genitalia; females are separated by the sulcation of the pronotum, the shape of the ventral ovipositor valves, and the caudal shape of the ultimate sternite.

DESCRIPTION OF PLESIALLOTYPE MALE: North Carolina, Macon Co., Satulah Mountain south of Highlands, Aug. 30, 1948 (J. J. Friauf).

Averaging smaller in all measurements than *D. australis* (Table 1). Head and pronotum as in *australis*, except for the following differences: frontal costa widest slightly above antennal bases and more sharply convergent into the fastigium; sulcation of frontal costa greater about and below than above the median ocellus; eyes more globose; prozona less tumid, median carina nearly as prominent on prozona as on metazona; transverse sulci of prozona as deep as the principal sulcus, the posterior prozonal sulcus complete and as distinct as the anterior prozonal sulcus; ventro-caudal angle of lateral pronotal lobes sharper and not evenly rounding into caudal margin of lobes.

Tegmina variable, but more regularly ovate than in *australis*, with the dorsal (posterior) border as convex as the ventral (anterior) border.

Femora smaller, but of the same relative proportions as in *australis*; cephalic femora 3.60 mm, middle femora 3.82 mm, and caudal femora 9.58 mm in length; caudal tibiae with 8-9 external, 11 internal spines (8-10 external and 10-11 internal spines in series of males examined).

Ultimate tergite (supra-anal plate) somewhat longer than broad, the lateral margins sinuate and not evenly rounded as in *australis*, and the furculae shorter and very much narrower at the base; cerci similar to those in *australis*.

Concealed genitalia distinctive in caudal aspect as indicated in fig. 5.

COLORATION OF MALE: Except for the differences in coloration already noted, the general color pattern of *D. zimmermanni* agrees very well with that of *D. australis*.

FEMALES: Rehn and Rehn (1936) have given a detailed and accurate description of the morphological characters and coloration of the female of this species based on the specimen collected by Franklin Sherman on Pinnacle Mt., South Carolina.

DISTRIBUTION: All of the known specimens of this species in United States collections are as follows: NORTH CAROLINA: Haywood Co., Crestmont, July 29, 1922 (T. H. Hubbell), 1 female (Univ. Mich., Mus. Zool.); Macon Co., Satulah Mountain south of Highlands, Aug. 30, 1948 (J. J. Friauf), 1 male; Macon Co., Yellow Mountain north of Highlands, Sept. 8, 1948 (J. J. Friauf), 1 male; Yellow Mountain, north of Highlands, Aug. 1-2, 1953 (J. J. Friauf), 4 males, 6 females. SOUTH CAROLINA: Pickens County, Pinnacle Mountain, Aug. 3, 1926 (F. Sherman), 1 female (previously recorded in Rehn and Rehn, 1936, and deposited in the U. S. National Museum). It is probable that this species can be found in the dwarfed oaks near the tops of all the higher mountains in the southern Appalachians.

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THREE NEW *TYPHLODROMUS* FROM SOUTHERN FLORIDA (ACARINA: PHYTOSEIIDAE)

DONALD DE LEON
Coral Gables, Florida

The phytoseiids appear to be mostly predaceous mites preying on plant-feeding mites and on scale insects. In spite of the importance of many of them as biological control agents, the species in Florida are poorly known. Until the publication of Dr. Muma's paper (1955)[1] on the phytoseiids found on Florida citrus only five species had been recorded from the state from all hosts. In his paper Dr. Muma lists eleven species, nine of which were new records for the state—six of these new species.

All measurements are in microns, and are averages unless variation from the average is more than ten percent, in that case the range is given.

Typhlodromus alveolaris, n. sp.

(Figures 1-3)

T. alveolaris belongs to the group of mites in this genus with eight lateral setae on the dorsal shield and L6 about in line with D5; it differs from the other two species (*aberrans* Oud. and *irregularis* Evans) with these characters in having four pairs of preanals.

FEMALE: Body broadly oval; dorsal shield irregularly imbricate, the anterolateral and lateral parts as far as M2 areolate, 290 long, 156 wide at about S1. In the following measurements setal length is given above the line, distance between setal bases below the line; for lateral setae this is the distance to the setal base behind, for the others it is the transverse distance between bases: L1 $\frac{17}{21}$, L2 $\frac{16}{26}$, L3 $\frac{19}{25}$, L4 $\frac{20}{30}$, L5 $\frac{26}{35}$, L6 $\frac{28}{100}$, L7 $\frac{13}{4}$, L8 83; M1 $\frac{13}{53}$, M2 $\frac{62}{78}$; D1 $\frac{15}{3}$, D2 $\frac{12}{15}$, D3 $\frac{11}{8}$, D4 $\frac{13}{17}$, D5 $\frac{12}{17}$, D6 $\frac{10}{21}$; S1 15; VL1 14; three pairs of pores as indicated in figure. Anterior end of peritreme reaching to about midway between coxae II and III, peritremal plate ending behind coxa IV in a blunt hook. Sternal plate indistinct, posterior margin not determinable; genital plate 80 wide at caudal end; ventrianal plate 104 long, 78 wide with four pairs of preanals and a pair of large pores 14 apart. Fixed digit with a small tooth near end and a larger one just proximal of it, moveable digit with one tooth proximal of curve. Legs slender without macrochaetae, but dorsal setae of patellae, tibiae and basitarsi rather stout and patella I with a stout setae 19 long on anterior margin near base at about right angle to margin; tarsus IV 112 long, not including pretarsus.

MALE: Not known.

Holotype: Female, Coral Gables, Florida, October 20, 1955 (D. De Leon) from *Cassia* sp.; taken from leaves infested with *Brevipalpus phoenicis* and large numbers of an apparently undescribed species of *Tarsonemus*.

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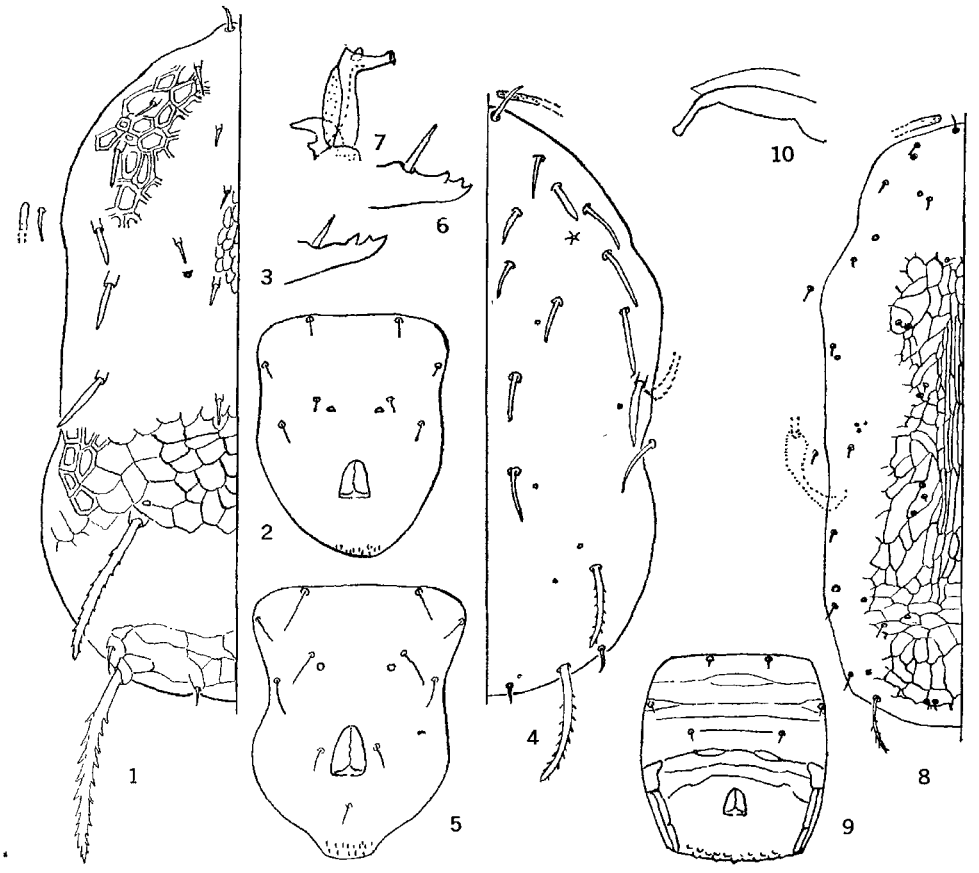
[1] Muma, M. H. 1955. Phytoseiidae (Acarina) associated with citrus in Florida. Ann. Ent. Soc. Am. 48(4) : 262-272.



Typhlodromus alveolaris, n. sp.: Fig. 1, dorsal shield; Fig. 2, ventrianal plate; Fig. 3, teeth of fixed digit.

Typhlodromus cornus, n. sp.: Fig. 4, dorsal shield; Fig. 5, ventrianal plate; Fig. 6, teeth of fixed digit; Fig. 7, spermatophore.

Typhlodromus paspalivorus, n. sp.: Fig. 8, dorsal shield; Fig. 9, ventrianal plate; Fig. 10, spermatophore.

Typhlodromus cornus, n. sp.

(Figures 4-7)

T. cornus belongs to the group of mites in this genus with eight lateral setae on the dorsal shield of the female and L6 about in line with D4; it differs from the other three species (*confusus* (Garman), *pini* Chant, and *citri* Garman & McGregor) in this group by having among other characters L8 and M2 more than three times as long as L7.

FEMALE: Body oval, light tan; dorsal shield 285 long, 155 wide, mildly imbricate with 16 pairs of setae. In the following measurements the same system is used to record setal length and distances between bases as in *T. alveolaris*:

L1	20-29,	L2	14-20,	L3	24,	L4	22-28,	L5	31,	L6	34,	L7	11-14,	L8	65;	M1	16-20,	M2	47;
	10-14		13		20		25		30		134		15				55		91

D1	20,	D2	16,	D3	15,	D4	20,	D5	20-26,	D6	9;		
	2		19		17		19		20		16		

S1 20, S2 31, VL1 39; seven pairs of pores as indicated in figure (some specimens have fewer, and a pore may be present on one side and not the other); in some specimens S2 sometimes on shield; of ten specimens, it is on the shield on both sides, in one specimen, and on the shield on one side only in four specimens. Anterior end of peritreme reaching to D1. Sternal plate indistinct posteriorly, with apparently two pairs of setae; genital plate 64 wide at caudal end; ventrianal plate 82 long, 65 wide with four pairs of preanals and a pair of large pores 16 apart. Fixed digit with teeth as shown in figure; moveable digit with a very small tooth at base of curve. Legs relatively short; tarsus IV with a tapering macroseta on basitarsus 23 long, length of tarsus excluding pretarsus 89.

MALE: Resembles female, but S2 always on shield; dorsal shield 217 long, 138 wide. Spermatophore of shape shown in figure, the foot 7 long, the shaft 12 long.

Holotype: Female, Coral Gables, Florida, June 4, 1956 (D. De Leon) from *Callicarpa americana*. *Allotype*: Coral Gables, September 15, 1956 from *Coccolobis laurifolia;* other *paratypes*: two females, same data as for holotype; three females and one male, same data as for allotype; one male and one female, Coral Gables, November 2, 1956, from *Citrus mitis*, and one female from orange, Coral Gables, November 3, 1956. Additional specimens have been collected from *Sida* sp. and from *Eugenia* sp., Delray Beach; two specimens in bad condition collected from guava in 1954 probably belong here.

Typhlodromus paspalivorus, n. sp.

(Figures 8-10)

T. paspalivorus belongs to the group of mites in this genus with nine pairs of lateral setae and M2 not paired with L7 or L8. It is distinguished from other members of this group by having most of the setae of the dorsal shield short (9-12 microns) and the scale-like markings of the dorsal shield between D4 and D5 very much longer than wide.

FEMALE: Body whitish, dorsal shield nearly rectangular, 344 long, 146 wide at S1, 139 wide at L6, mildly but distinctly imbricate, scale-like markings (hereafter called scales) between D4 and D5 and extending from a point about even with M1 to a point about in line with L7 very much longer than wide (about 3.5 wide, 25-35 long), forward of these narrow scales and lateral of them to margin of shield scales less regular in shape and not as elongate, a few being nearly circular in outline; scales in area bounded approximately by L7 and M2 faint and somewhat wider than long, behind this area scales distinct, larger and mostly longer than wide; all dorsal shield setae smooth, except L9. The same system is used here to record setal lengths and distances between setae as that used for *T. alveolaris*:

L1	11,	L2	11,	L3	11,	L4	12,	L5	11,	L6	14,	L7	15,	L8	19,	L9	52; M1 9,
	25		36		38-47		58		45		40		30		23		65

M2	17;	D1	11,	D2	9,	D3	10,	D4	11,	D5	11,	D6	9;	S1	11,	S2	10; VL1 25
	77		14		30		14-19		35		32		28				

(smooth); pores distributed as shown in figure. Anterior end of peritreme extending almost to D1. Sternal plate with faint elongate scales and three pairs of setae; metapodal plate tapering caudad 35 long, 4 wide; ventrianal

plate 111 long, 82 wide, about as wide at anterior end as posterior end of genital plate which it almost touches, with three pairs of preanal setae and with a pair of small nearly circular pores 33 apart. Fixed digit 21 long with three to five teeth behind terminal hook and a lateral tooth between terminal hook and first tooth; moveable digit 21 long with one tooth just proximal of curve. Legs without macrochaetae.

MALE: Resembles female, but imbrications of dorsal shield less distinct; dorsal shield 260 long, 120 wide; spermatophore of shape shown in figure; fixed digit with two teeth close behind terminal hook; moveable digit with one tooth.

Holotype: Female, Coral Gables, Florida, May 29, 1956 (D. De Leon) under leaf sheath of *Paspalum* sp. in association with colony of *Steneotarsonemus paspali* DeL. and *S. furcatus* DeL. on the former or on both of which this species almost certainly feeds. *Allotype*: same data as for holotype; other *paratypes*: five females, two collected October 10, 1955 and three May 29, 1956, other data same as for holotype.

Paratypes of the latter two species will be deposited in the University of Florida Collections, Gainesville.

SOME OBSERVATIONS ON THE PLASTER BAGWORM, *TINEOLA WALSINGHAMI* BUSCK (LEPIDOPTERA: TINEIDAE)

L. A. HETRICK
College of Agriculture, University of Florida

Although there is some doubt about the validity of the specific name for the plaster bagworm, the name given in the title has been in common usage for more than twenty years. The very short description of the insect by Busck (1933) is accompanied by a statement that the larvae are not cloth feeders but eat remains of insects caught in spider webs. In the same year Kea (1933) stated that larvae of *Tineola uterella* Walsingham [=*walsinghami* Busck(?)] refused insect remains but were in reality feeders on woolens and furs like other familiar members of the family. Watson (1939, 1946) has repeated the observations of Busck so far as feeding on dead insects is concerned but recognizes the species as an important household pest. Mallis (1954) repeats Watson's statements about the larvae feeding on insect remains in spider webs and adds that this is a precarious way for an insect to make a living.

Within infested buildings the cases of the plaster bagworm are quite noticeable on light-colored plastered walls. Grains of sand are commonly attached to the exterior of the silken cases and it is only logical for the layman to assume that the little creatures within the cases are feeding on the plaster. If such infested buildings are carefully examined, additional cases will be found under furniture and attached to woodwork where they are much less obvious than on the walls.

Over a period of more than 20 years the writer has observed the plaster bagworm in the Gulf Coast region. In addition to the infestations within buildings, the insect occurs under buildings where the cases hang from subflooring, joists, sills, and foundations. Cases may be found attached to the exterior of buildings in shaded locations, under farm sheds, under lawn furniture, attached to stored farm machinery, and even on tree trunks.

The question of the food of these larvae in these unusual situations has been of interest to the writer for many years. It was not until recently that some detailed studies of the insect were made to determine its food habits under out-of-doors conditions. Busck (1933) was on the right track but did not carry his observations far enough. Although fragments of dead insects are occasionally attached to the exterior of the cases (as are sand, bits of paint, shreds of paper, etc.), the most common and abundant food of the species is old spider webs which are consumed in large quantities. Under caged conditions the larvae are also fond of webs of Corrodentia and Embiidina from the trunks of trees. Larvae do not hesitate to chew holes in old abandoned cases of their species and it is assumed that this silk is utilized as food. Perhaps other types of webs also serve as food under conditions in nature.

The structure of the case of the plaster bagworm is interesting. It has been described as having the shape, size, and flatness of a cantaloupe seed. Unlike the cases of most case-bearing Lepidoptera, the case of the plaster bagworm is the same on both ends. Slit-like openings occur at each end

of the case and it is not possible to say that one end is anterior and the other posterior. A larva within a case can quickly reverse its direction and feeding is done from either end.

The plaster bagworm requires a high humidity which is probably the most important limiting factor in its distribution in North America. The author has observed the insect in many parts of Florida and Louisiana. Files of the Plant Pest Control Division of U. S. D. A. Agricultural Research Service contain additional records from Mississippi and North Carolina. It is reasonable to assume that the plaster bagworm may also occur in coastal areas of Alabama, Georgia, and South Carolina with possible distribution extending into parts of Texas and Virginia.

A braconid wasp, *Apanteles carpatus* (Say) (det. Muesebeck), and an Ichneumon wasp, *Lymeon orbum* (Say) (det. Luella M. Walkley), have been reared from the plaster bagworm. The plaster bagworm is a new host record for both of these parasites although the Braconid is a common parasite of other species of clothes moths.

Summary

The plaster bagworm, *Tineola walsinghami* Busck, is found in many unusual situations in nature. Infestations in buildings, like other species of clothes moths, are injurious to articles made of wool and fur. Under conditions out-of-doors, the food of the larvae consists mostly of spider webs. Webs of Corrodentia and Embiidina from tree trunks are acceptable as food by the larvae. Larvae also chew holes in abandoned cases of their species and it is assumed that this silk is utilized as food.

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A NEW GENUS OF ISCHNOCERA (MALLOPHAGA)[1]

K. C. EMERSON [2] AND ROBERT E. ELBEL [3]

While identifying a collection of Mallophaga from Thailand, it was found that one of the forms could not be included in any of the described genera. It is herewith described, illustrated, and made the type of a new genus.

Galliphilopterus, n. gen.

Medium-sized Ischnocera. Head large with expanded temples. Wide hyaline margin which originates at the distal end of marginal carinae. Dorsal anterior plate of forehead with rounded posterior margin, and prolonged into a thickened posterior point. Ventral carina fused to distal end of marginal carina on each side. Pulvinus wide and attached to edges of ventral carinae. Ventral anterior plate and gular plate absent or indistinct. Anterior dorsal setae, preantennal setae, and post nodal setae elongated. Antennae similar in the two sexes. Tergal plates of abdominal segments separated medianly. Median chaetotaxy of tergal plates with thick flattened setae. Abdominal sternal plates indistinct. Terminal abdominal segment of male with rounded posterior margin. Posterior margin of female vulva with a row of small setae. Male genitalia simple, with inward curved parameres.

TYPE SPECIES: *Galliphilopterus brunneopectus* n. sp.

Normally in Ischnocera, the nearest affinities of a genus are other genera parasitic on the same host order. At present, no related genera have been found on the Galliformes. Elongated preantennal setae have heretofore been found only on species of the genus *Mulcticola*. The members of this genus are slender, and are known only from the host order Caprimulgiformes. In addition, shape of the dorsal anterior plate of the forehead, chaetotaxy of the abdominal segments, and the male genitalia are distinctive.

Galliphilopterus brunneopectus, n. sp.

MALE: General shape and size as indicated in figure 2. All setae of forehead elongated. Temples with two long, one medium-length, and three short marginal setae. Antennae filiform. Prothorax with one seta in each posterior lateral angle. Posterior margin of pterothorax with ten long setae. Tergites divided medianly. Elongated post spiracle setae. One row of thick flattened setae on posterior margin of abdominal tergites II-VII; number on each is: II-10, III-16, IV-12, VI-6, and VII-6. All other setae of normal shape. Chaetotaxy of abdominal sternites is: II-4, III-8, IV-8, V-8, VI-2, and VII-2. Genital region as shown in figure 2. Genitalia as shown in figure 3.

FEMALE: General shape and size as indicated in figure 1. Chaetotaxy of thick flattened setae on abdominal tergites is: II-10, III-20, IV-20, V-20,

[1] This investigation was supported by research grant E-1722 from the National Institute of Allergy and Infectious Diseases of the National Institutes of Health, Public Health Service.

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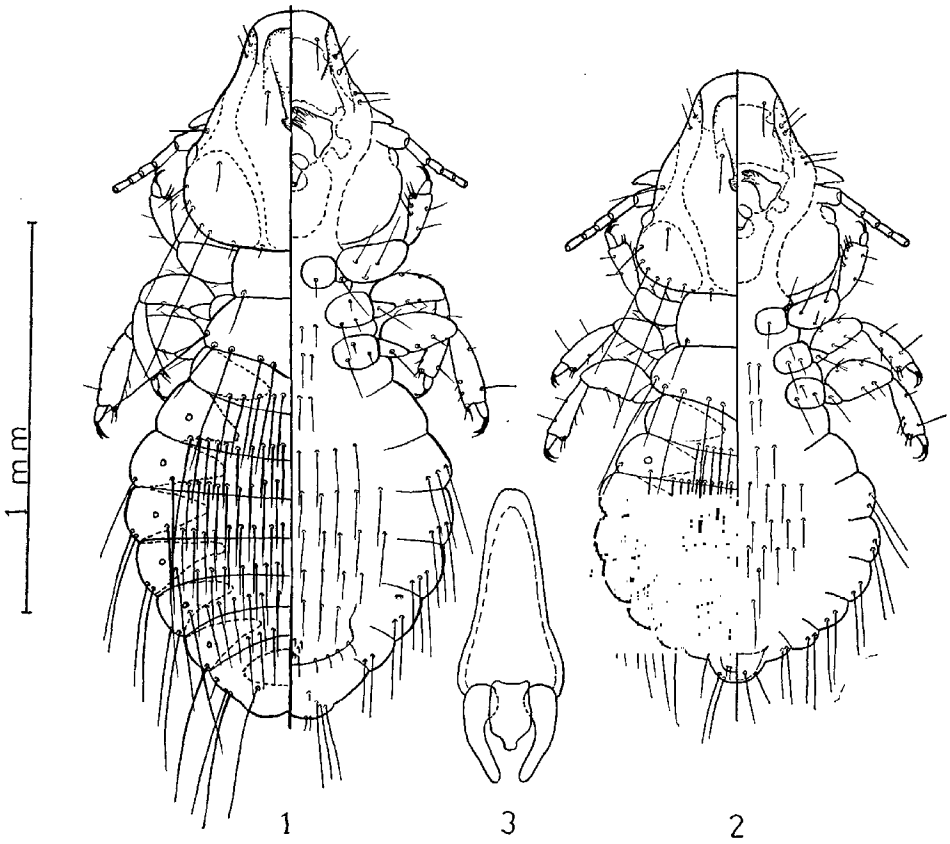
VI-14, VII-12, and VIII-6. Chaetotaxy of abdominal sternites is: II-4, III-8, IV-10, V-10, VI-8, and VII-8. Genital region as shown in figure 1.

Type host: *Arborophila brunneopectus brunneopectus* (Blyth).



Galliphilopterus brunneopectus, n. sp.
Fig. 1. Dorsal-ventral view of female.
Fig. 2. Dorsal-ventral view of male.
Fig. 3. Male genitalia.
Figures 1 and 2 are drawn to the same scale.

Type materials: Holotype male, allotype female, and three paratypes collected on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei, Thailand by Robert E. Elbel and Boonsong Lekagul on April 1, 1954. Three paratypes from the same location were collected on March 4, 1955, by the same individuals. The holotype and allotype have been deposited in the U. S. National Museum.

The authors gratefully acknowledge the assistance given by Dr. Theresa Clay, British Museum (Natural History) and Mr. H. G. Deignan, U. S. National Museum, during the preparation of this paper.

MINUTES OF THE 40TH ANNUAL MEETING OF THE FLORIDA ENTOMOLOGICAL SOCIETY

The 40th Annual Meeting of the Florida Entomological Society was held in the San Juan Hotel, Orlando, Florida, on September 12th and 13th, 1957. Registration was from 5:00 to 10:00 P.M. on Wednesday, September 11th, and 8:00 to 9:00 A.M. Thursday, September 12th, with 145 registered.

On Wednesday evening two color films were shown, "The Rival World", courtesy of Shell Chemical Corporation, "The 1956/57 Medfly Campaign in Florida", courtesy of the U. S. Department of Agriculture.

The opening session began at 9:00 A.M. Thursday, September 12th, with Dr. Milledge Murphey, Jr., presiding.

Thirty-nine papers, including three invitational papers and invitational panel discussions were presented to the Society. The invitational papers were:

"Plant Pest Surveys and Their Importance", by Kelvin Dorward, Head, Plant Pest Survey Section, USDA, Washington, D. C.

"A Review of the Population Theory", by Francis R. Lawson, Entomology Research Division, USDA, Oxford, N. C.

"The Medfly in Florida—Past, Present and Future", by G. G. Rohwer, Area Supervisor, Southeastern Regional Plant Pest Control Branch, Mediterranean Fruit Fly Laboratory, Lake Alfred, Florida.

Panel Discussion: "Aspects of Screwworm Research and the Proposed Screwworm Eradication", W. G. Bruce, Moderator; C. L. Smith, Research; A. J. Graham, Larval Rearing; A. H. Baumhover, Irradiation; Dr. R. S. Sharman, Eradication, Agricultural Research Service, USDA.

On Thursday at 3:15 P.M., a tour of the U. S. Department of Agriculture Laboratory at Orlando was made, followed by a most enjoyable Social Hour in the ball room of the San Juan Hotel, which was provided by Industry.

The first business meeting was called to order by President Murphey at 11:40 A.M. on Thursday, September 12th. President Murphey asked for a report of the Secretary. The Secretary gave the following report on the Executive Committee meeting held Wednesday at 9:00 P.M.

1. The Executive Committee voted to approve the recommendation made by the committee appointed to study the possibility of raising dues of the Society. The committee composed of L. A. Hetrick, Chairman, H. A. Denmark and W. P. Hunter, recommended the annual dues of the Society be increased to $5.00.
2. The Executive Committee voted to recommend the Society consider having the incoming president appoint a committee to study and make recommendations as to the use of Society funds in fulfilling the first objective of the Society, which is to promote the study of entomology and the fourth objective, of publishing the Florida Entomologist.
3. The Executive Committee voted to recommend the constitution amendment to provide for branches to the Society be adopted with the exception of Section 3, because it is in conflict with other sections of the constitution.
4. The Committee voted to propose to the Society that the Society consider appointing a committee to study the advisability of amending the constitution to include a public relations committee, which would be appointed each year by the President.

The Secretary also reported that we now have 252 members, five of which are honorary, and 36 new members. Library subscriptions to the Florida Entomologist in the United States now totals 55, foreign subscriptions 29, exchange subscriptions in the United States 26, and foreign 14. The Secretary reported that of the present membership 22 are behind two

years in their dues and 41 are behind one year and will be dropped unless dues are put in order.

The President asked for a report of progress on the use of the "Entomology in Action" talk and slides. Lewis M. Wright reviewed what had been done with the talk and slides and informed the group of their availability. The talk and slides can be obtained by contacting Lewis M. Wright.

The "Entomology in Action" committee consists of Mr. James E. Bragdon, Chairman, Dr. Milledge Murphey and Mr. Frank W. Mead, this year. Last year, Mr. Lewis M. Wright did a fine job of assembling a series of 35 mm color slides depicting entomology in action. From this series of slides and other sources we have assembled thirty 8 x 10 color prints of eye-catching photos to make the exhibit in the lobby. When assembled, the exhibit is 11 feet long. It can be separated into five plywood panels which can be pushed into a crate capable of fitting into most automobiles. The cost of preparing this exhibit has been $140.40. For the most part we expect this exhibit to be used by Mr. Bragdon in his extension course with 4-H groups.

In choosing our pictures we have tried to use those pictures which we believe will most likely catch the eye of the student and possibly cause him to consider entomology as a career. The committee will welcome any suggestions or slides which will improve the exhibit.

President Murphey asked for a report of the Insecticide Committee. Lewis M. Wright asked that this report be given by Mr. J. A. Mulrennan of the Florida State Health Department. Mr. Mulrennan stated that since the meeting in Tallahassee last year and after discussions with members of industry, it had been determined that existing regulations were sufficient to control the problem of pest control operators using highly toxic organic phosphate insecticides carelessly around homes.

Dr. Wolfenbarger made a proposal that an effort be made to secure copies of National Agricultural Chemical Association News, Volume 15, No. 5, which gives several articles on career opportunities in agricultural chemicals, to supply to high school libraries throughout the State. In the discussion following it was generally agreed that this would do much to promote entomology in Florida. President Murphey requested the Secretary to obtain these publications and make the mailing when they were received.

President Murphey called for the Treasurer's Report. Mr. Denmark pointed up the financial condition of the Society and the need for increasing dues to obtain additional moneys. Dr. Weems moved the Treasurer's Report be accepted, seconded by Dr. Rhoades, unanimously carried.

Dr. Pratt moved for adjournment, Mr. Denmark seconded, and the meeting was adjourned.

The second and final business meeting was called to order by President Murphey at 4:30 P.M. Friday, September 13th.

President Murphey called for a report of the Auditing Committee, which was given and unanimously accepted.

President Murphey called for a report of the committee on constitutional revision to provide for branches of the Florida Entomological Society. Dr. Wilson, Chairman, read the proposed amendment which follows:

Report of the Committee on Constitutional Revision to Provide for Branches of the Florida Entomological Society

At the last annual business meeting the Sub-Tropical Branch of the Florida Entomological Society was established. The creation of this branch and the possibility that it may be desirable to organize other branches in the future makes it necessary to amend the Constitution of the Society. President Murphey has appointed F. Gray Butcher and John W. Wilson to a committee on Constitutional Revision.

Your committee recommends that the Constitution of the Florida Entomological Society be amended by adding another article to be known as Article VIII and that Article VIII read as follows:

ARTICLE VIII

BRANCHES

Section 1.—*Branches* are established on a geographical basis, for the purpose of holding meetings, presenting papers, conducting conferences and stimulating interest in entomology.

Section 2.—*Membership* in a Branch shall be restricted to members of the Society residing or stationed in the area covered by the Branch.

Section 3.—*Officers of Branches.* The officers of each Branch shall be a Chairman, a Vice-Chairman, a Secretary-Treasurer, and a Representative of the Executive Committee. Election to these offices shall be restricted to voting members of the parent Society. They shall be elected at the annual meeting of the Branch by procedures to be adopted by the Branch.

Section 4.—*Activities of Branches.* Branches may hold meetings or conferences at appropriate times and places. Branches shall not charge dues, but they may charge registration fees for those in attendance at meetings in an amount to be determined by the Branch. A charge may also be made for the proceedings, minutes or records of Branch meetings.

Section 5.—*Establishment of Branches.* To become established, proposed Branches must formally petition the Society, be endorsed by the Executive Committee and be approved by the Society. The petition must set forth the territorial limits of the proposed Branch and indicate clearly the particular purpose for which the Branch is to be formed; that an organized group of society members desiring to form a Branch already exists; and that the establishment of the proposed Branch will be useful to the Society and to entomology. The currently existing Branch which has been established by the Society is the Sub-Tropical branch.

The committee also recommends that Article II last sentence which now reads, "Branches or affiliated societies shall function under such agreements and understandings as may be entered into at the time of their organization or their becoming affiliated with the Society subject thereafter to such subsequent modifications as may be mutually satisfactory" be amended to read, "Branches of the Society shall be established and function under the provisions of Article VIII.

F. Gray Butcher *John W. Wilson*

The Committee recommended the amendment be adopted. Dr. Wilson moved that the report of the Committee be accepted. Considerable discussion followed by Mr. Gilbert and others concerning Section 3 of the amendment which had to do with a representative on the Executive Committee. It was pointed out that this part of Section 3 was in conflict with other sections of the constitution. Dr. Rhoades proposed that Section 3 be amended. Dr. Butcher proposed that the first sentence of Section 3 be amended to read, "The officers of each Branch shall be a Chairman, a Vice-Chairman, a Secretary-Treasurer and a representative on the executive committee".

The amendment was adopted by vote.

Dr. Wilson moved that a committee be appointed by the incoming president to study the possibility of a constitutional amendment to increase size of the executive committee to include a member from each branch of the Society. It was unanimously carried.

Dr. Butcher gave the following report on the establishment and growth of the Sub-Tropical Branch:

"In September, 1955, a group of 13 persons interested in the field of Entomology held an informal meeting at the University of Miami to discuss

the desirability of forming an Entomological Society in the Miami area. Dr. John E. Porter, U. S. Public Health Service Entomologist, had been instrumental in calling the group together; he was elected temporary Chairman and requested to designate an Executive Committee to plan for the continuation of the group with regular monthly meetings. This original Executive Committee was composed of Dr. Porter, Dr. F. G. Butcher, Mr. Robert Curran, Mr. James Heidt, and Mr. A. S. Mills.

"Thus a local entomological society was initiated and has continued with monthly meetings for the two years since that date. At the first regular meeting the following month, the 29 persons present received an inspiring impetus for continuation of the society from an outstanding talk by Dr. Maurice W. Provost from the Florida State Board of Health. In January, 1956, after an average attendance of 22 persons at meetings the 3 previous months, the group voted to organize more definitely as the Sub-Tropical Entomologists of Florida, and elected Dr. Porter as President, Dr. D. O. Wolfenbarger, Vice-President, and A. S. Mills, Secretary-Treasurer. At that time the group also voted to request that they be designated as the first Branch of the Florida Entomological Society. You will recall that this request received favorable action at the last annual meeting of this Society, with certain requirements designated for becoming a Branch. Those requirements were officially approved by the Miami group in November, 1956.

"The Branch functions under the direction of an Executive Committee consisting of the officers (Branch Chairman, Vice-Chairman, Sec.-Treas.), a Program Chairman, and one other member selected by the officers. This committee of 5 members assists in arranging for a monthly program, gets notices of meetings to all members and affiliates, and meets each month before the regular meeting of the Branch to discuss and develop recommendations to the group on needs and activities of the Branch.

"The objectives of the Sub-Tropical Branch of Florida Entomological Society are those of the Society, especially to promote the interests of the profession. Our meetings, held on the 2nd Wednesday evening of each month, feature a designated speaker on some phase of entomological subject matter, and numerous reports from members on insect occurrence or activity observed during the month. We have completed one Society project, namely a window display on the Mediterranean Fruit Fly in Burdine's Department Store in Miami, thus attempting to meet the Society objective No. 3, 'to distribute widely knowledge pertaining to insects'.

"We believe our Branch is firmly established. Many phases in the field of Entomology have been the basis for the 22 programs since our first meeting, including Insects and Public Health, Crop Pests, Insect Ecology and Development, Insecticides and Toxicology, and miscellaneous items. Our attendance figures indicate a present strong organization; we have had an average attendance of 18 persons for the 22 meetings since we started, and this average has been over 20 persons for the last 6 meetings.

"We believe that we can contribute to the well-being of the Florida Entomological Society. Local publicity on our monthly meetings tends to keep the general public advised of entomological work. The monthly reports from members on their entomological observations will soon develop some interesting and valuable local insect records. Additional distinct projects sponsored by the Branch will aid in the development of our profession in southern Florida, and can be an important item in attracting students into the field of professional entomology. We have secured several new members for the Society.

"All members of the Florida Entomological Society are most cordially invited to meet with us at the University of Miami on the 2nd Wednesday evening of each month whenever they are in the South Florida area at that time. In the meantime, we solicit the suggestions and recommendations of the Society's officers and members for the activities and operations of the Branch."

Dr. Kerr reported on an entomological group that has been formed at Gainesville. This group consists of 30 or more entomologists in the Gainesville area. Dr. Morse and Dr. Berner are their co-chairmen and Dr. Kerr is

program chairman. The group meets once each month at a luncheon and at present is not especially interested in becoming a branch of this Society. The group is restricted to professional entomologists.

President Murphey asked for new business.

Gregg Rohwer, Chairman of the Cotton States Branch Public Relations Committee, reviewd work his committee is doing to inform our Society things our Public Relations Committee can do to benefit the Society. Rohwer explained the use of a talk aimed at furthering a study of entomology, which can be used on a cross state basis. The Cotton States Branch is preparing portable exhibits to further public relations. Rohwer cited the need for state societies "carrying the ball" on public relations.

Mr. Bragdon explained to the group what could be done to formulate interest in the field of entomology by working with 4-H Club boys and girls. He explained the 4-H Club entomology project. He encouraged membership to pledge their help to county and home demonstration agents, to attend as local advisors to boys and girls in 4-H Club entomology work.

Dr. Tissot made the following motion:

> "It is moved that the incoming President appoint a committee of three members for the purpose of preparing, for presentation to the members at the 41st Annual Meeting, a revision to the constitution setting up a permanent Public Relations Committee whose duties will be to handle such matters as publicity, education, and general public relations under the first objective given in the constitution, which is 'To promote the study of entomology'. It is further moved that the proposed revision take into account the problem of allocation of Society funds among the various activities, such as publishing the Florida Entomologist, public relations and general Society expenses."

The motion was seconded by Mr. Mayeux and unanimously carried.

Mr. Butcher moved that the incoming President appoint a Public Relations Committee to function during this year. Motion was seconded by Mr. Rhoades,—unanimously carried.

Herman Mayeux moved:

> "That the Society recommend to the New Public Relations Committee that the Committee consult Mr. James E. Bragdon concerning his request to serve as local 4-H Club leaders to assist in the 4-H Club insect project, that the Committee take on this assistance as a regular society project and work between Mr. Bragdon and the membership to further the entomology project in all ways possible."

Dr. Whipp rose to ask the feeling of the group on whether nematologists are considered entomologists or pathologists, and whether we should make a special effort to get them to join our Society. Mr. Gilbert stated that the National Society recognizes nematologists as entomologists.

Dr. Wolfenbarger made a motion that the membership committee study whether nematologists should become members of the Society. Considerable discussion followed as to whether we should have a separate membership other than the executive committee. Dr. Jim Griffiths moved that a membership committee be appointed by the incoming President. Carried unanimously.

President Murphey called for a report of the Resolutions Committee, which was given by Herman Mayeux:

Resolutions

I. Whereas the membership of this Society is cognizant of the objectives of this society, as given in the constitution; and, whereas, a program of activity was initiated following our Thirty-Eighth Annual Meeting, its primary purpose being "to promote the study of entomology", which is the first objective given in the constitution; and, whereas several activities are now under way, be it resolved that this program be continued with full participation of the membership and that additional activities be added to this

program during the coming year. *Be it further resolved* that the work of this program be done through the Public Relations Committee under the direction of the Executive Committee.

II. Whereas, there is increasing emphasis on the part of the entomological profession to obtain better public relations, and in consideration of the fact that the Public Relations Committee of the Cotton States Branch of the Entomological Society of America has proposed that the Branch sub-committee for each state be the same persons who are already assigned public relations duties by the state organizations, be it resolved that the services of the Public Relations Committee of the Florida Entomological Society be offered by the President to the Chairman of the Public Relations Committee of the Cotton States Branch, to act as the Florida sub-committee for the Branch simultaneously to acting as committee for this Society.

Be it further resolved:

III. That the "Entomology in Action Exhibit" Committee, consisting of James Brogdon, Frank Mead, and Milledge Murphey, Jr., be commended for preparing the beautiful and educational exhibit, which they presentd at this fortieth annual meeting, and which is for use by the membership to promote interest in entomology.

IV. That a note of thanks be extended to the officers, individuals and committees of our Society, invitational speakers, to the management and employees of San Juan Hotel and to the Orlando Convention Bureau, all of whom contributed to the success of this Fortieth Annual Meeting.

V. That especial appreciation be expressed to the local arrangements committee:

Arthur A. Whipp
William E. Feistner, Jr.
Kenneth H. Holden
Phil Arey
William Zimmerman and Mrs. Bea Zimmerman

and to the Program Committee:

H. V. Weems, Jr.
Wally Dekle
Frank Mead

VI. That a vote of thanks be extended to Industry for a most enjoyable social hour.

VII. That appreciation be expressed to Carroll N. Smith and other personnel of the U.S.D.A., E.R.B., Section of Insects Affecting Man and Animals, for the tour of their laboratories.

The report of the Resolutions Committee was adopted unanimously.

President Murphey extended his thanks to the officers and members of the Society for their cooperation during his term as President of the Society.

President Murphey called for a report of the Nominating Committee, which follows:

"It is the pleasure of the Nominating Committee to submit the following slate of names as nominees for the various offices as indicated, to serve the Society during the year 1958:

President.....Irwin H. Gilbert
Vice-President.....William P. Hunter
Secretary.....Robert O. Kirkland
Executive Committee.....Henry True
Editor of Florida Entomologist.....Lewis Berner
Associate Editor Florida Entomologist.....Norman N. Hayslip"

Dr. Butcher moved the slate be accepted unanimously.

President Murphey informed the membership that Mr. George B. Merrill had been elected to honorary membership of the Society. Most of the membership returned their ballots, all of which were in the affirmative. Mr. Merrill's election to the honorary membership makes a total of 6 in our Society.

Incoming President, I. H. Gilbert, was escorted to the speaker's stand. Mr. Gilbert expressed his thanks for the honor bestowed upon him and appointed the following committees:

Lewis Wright—Entomology in Action Talks.
Jim Brogdon—Entomology in Action Display.

Dr. Butcher moved we adjourn, Dr. Wolfenbarger seconded the motion and the meeting was adjourned.

Respectfully submitted,
R. O. KIRKLAND,
Secretary

REPORT OF TREASURER-BUSINESS MANAGER FOR THE YEAR ENDING AUGUST 31, 1957

RECEIPTS

Hospitality Hour Funds	$ 300.00
Registration Fees	69.00
Banquet Fee	183.00
From 56 Convention unaccounted for	10.00
Dues	584.75
Subscriptions	318.25
Reprints	39.38
Advertising	936.95
Back Numbers	215.00
Cost Plates	3.80
	$2,660.13
Cash on hand 8/15/56	467.54
	$3,127.67

DISBURSEMENTS

Parker Printing Company	$ 6.40
Ronnie Reed (Hospitality)	55.34
Floridan Hotel	200.84
A. M. Phillips	11.27
Newman Lynde Associates	40.28
W. B. Tappan	15.48
City Transit	12.00
Herman Mayeux	13.83
Wilson Toomer	24.23
Pepper Printing Company	1,862.75
Eastman Kodak	3.95
Lewis Wright	8.02
Gadsen Office	17.00
Postage "Entomology in Action"	23.25
Milledge Murphey (mat exhibit)	128.04
Postage	71.33
Service charge (Florida National Bank)	1.79
Misc. (box rent, telephone calls, etc.)	13.78
	$2,309.58
Cash on hand 8/31/57	818.09
	$3,127.67

Respectfully submitted
H. A. DENMARK,
Treasurer