TAXONOMY AND DISTRIBUTION OF CHIGGERS (ACARINA: TROMBICULIDAE) IN NORTHCENTRAL FLORIDA

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ABSTRACT

Chiggers from the northern and north central regions of Florida were collected and identified. Seven species were found: Eutrombicula alfredcheidii (Oudemans), Eutrombicula splendens (Ewing), Fonseca (Paraspecies) gurneyi gurneyi (Ewing), Walchia americana Ewing, Euschongastia rubra Farrell, Miyatrombicula jonesae Brennan and Leptotrombidium peromysci VerCammen-Grandjean. Three species are reported for the first time in Florida. The species, Leptotrombidium peromysci, is redescribed as this is the first report in S.E. United States. A key to all the species currently reported in Florida is included.

Chiggers or trombiculid larvae are known to cause trombidiosis in much of the United States, but in the Oriental Region some chiggers transmit scrub typhus, Rickettsia tsutsugamushi. Chigger bites produce itching and swelling at the site of chigger attachment. Trombidiosis may also be accompanied by secondary infections and persistent lesions. The major species causing trombidiosis are Neotrombicula autumnalis (Shaw) and the 4 species of the genus Eutrombicula: alfredheidii (Oudemans), splendens (Ewing), batatas (Linneaus) and belkini (Gould). In addition the larvae of Neo-schongastia americana (Hirst) cause losses to the turkey industry particularly in the southern United States (Everett et al. 1972). Recent reports also indicate that chiggers are the cause of lesions on horses in the Pacific Northwest (Easton and Krantz 1973). Several surveys of states other than Florida contributed greatly to the knowledge of species and their distribution throughout the United States. In a preliminary study of the chigger species within the northcentral part of Florida, Dohany (1974) reported 6 species that were new to the State and 2 from new hosts. However, the knowledge of the trombiculid fauna of Florida is still fragmentary. The present research increases the known number of prevalent chigger species and outlines their distribution in North Central Florida.

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METHODS AND MATERIALS

Chiggers for this study were collected from litter samples, treeholes, black plates, and vertebrate hosts. Samples were taken at various locations in the northcentral parts of Florida, including the Tall Timbers Research Station, Leon County, and the Gainesville area, Alachua County. The majority of the samples (Bcrlesc and black plates), came from the Gainesville area.

Chiggers were collected into 80% ethanol and were mounted directly into Hay's modified Berlexe media on a microscope slide (Krantz 1970). Coverslips were applied and the slides were heated slightly with an alcohol burner until bubbles began to form. The slides were then dried in the oven and coverslips were ringed with Glyptal. The cleared chiggers were then identified to species.

RESULTS

In the present study, 7 species of chiggers were found, 3 of which are reported for the first time. One species, Leptotrombidium peromysci is re-described. The hosts from which the chiggers have been collected are listed in Table 1.

TABLE 1. THE HOSTS OF COLLECTED SPECIES OF CHIGGERS OF NORTHCENTRAL FLORIDA.

<table>
<thead>
<tr>
<th>Hosts</th>
<th>Chigger species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black racer, Coluber constrictor constrictor (Linnaeus)</td>
<td>Eutrombicula alfreddegei (Oudemans)</td>
</tr>
<tr>
<td>Corn snake, Elaphe guttata (Linnaeus)</td>
<td>&quot;</td>
</tr>
<tr>
<td>Eastern swift, Scoloporus undulatus (Lattie)</td>
<td>&quot;</td>
</tr>
<tr>
<td>Eastern grey squirrel, Sciurus carolinensis Gmelin</td>
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</tr>
<tr>
<td>Box tortoise, Testudine carolina (Linnaeus)</td>
<td>Eutrombicula splendens (Ewing)</td>
</tr>
<tr>
<td>Indigo snake, Drymarchon corsis couperi (Holbrook)</td>
<td>&quot;</td>
</tr>
<tr>
<td>King snake, Lampropeltis getulus getulus (Linnaeus)</td>
<td>&quot;</td>
</tr>
<tr>
<td>Eastern swift lizard, Scoloporus undulatus (Lattie)</td>
<td>&quot;</td>
</tr>
<tr>
<td>Common opossum, Didelphis marsupialis Linnaeus</td>
<td>&quot;</td>
</tr>
<tr>
<td>Barbour's pigmy rattlesnake, Sistrurus miliarius barbouri Gloyd</td>
<td>&quot;</td>
</tr>
<tr>
<td>Yellow rat snake, Elaphe quadrivittata quadrivittata (Holbrook)</td>
<td>&quot;</td>
</tr>
<tr>
<td>Common opossum, Didelphis marsupialis Linnaeus</td>
<td>Walchia americana Ewing</td>
</tr>
</tbody>
</table>
Checklist of Florida Trombiculidae

Family—Trombiculidae Ewing 1944.
Subfamily—Trombiculinae Ewing 1929.
Genus—Eutrombicula Ewing 1938.


Records: (Reported by Jenkins (1949); not recovered in our samples).


Genus—Fonsecia Radford 1942.


Subgenus—Fonsecia Radford 1942.

Records: Tallahassee, no collection date given, A. L. Dohany coll., from treeholes.

Genus—Trombicula Berlese 1905.

**Genus—Microtrombicula** Ewing 1950.  
Records: Tallahassee, no collection date given, A. L. Dohany coll., from treeholes.

**Genus—Leiptotrombicium** Nagayo, Miyagawa, Mitamura, and Ima-mura 1916.  

**Genus—Euschongastia** Ewing 1938.  

Records: Gainesville, no collection date given, A. L. Dohany coll., from treeholes.


**Genus—Blankaartia** Oudemans 1911.  

**Subfamily—Walchiinae** Ewing 1946.

**Genus—Walchia** Ewing 1931.  

**Key to Subfamilies, Genera, and Subgenera of the Known Trombiculidae of Florida**

1. Scutum without Antero-Median seta (AM); leg segmentation
Rohani & Cromroy: Chiggers

7-6-6; 4 scutal setae; sensillae expanded, lanceolate-clavate ...... WALCHIINAE, Walchia Ewing 1931

1'. Scutum with AM seta; leg segmentation 7-7-7; 5 scutal setae; sensillae flagelliform, filamentous or occasionally thickened ...... TROMBICULINAE 2

2. AnteroLateral (AL) setae of scutum stubby, peg-like; parasites of reptiles ................................................. Fonseca Radford 1942

2'. AL setae of scutum normal, usually barbed; wide host range ........... 3

3. Scutum pentagonal, with or without (AL) shoulders; coxae III with 1 or more setae ........................................ 7

3'. Scutum rectangular, trapezoidal or quadrate, without AL

4. Scutum rectangular with a sinus posterior margin; anterior setae post-marginal .............................................. Parasoea Loomis 1966

4'. Scutum without this combination of characters ...................... 5

5. Sensillae expanded distally, capitate to ovoid; palpal tibial claw with 3 or more prongs ........................................ Euschongastia Ewing 1938

5'. Sensillae filamentous; palpal tibial claw with 2-3 prongs ........... 6

6. Palpal tibial claw bifurcate with external prong always longer than internal prong; galeal seta nude; leg III with mastitarsala ........................................ Eutrombicula Ewing 1938

6'. Palpal tibial claw usually trifurcate; galeal seta always barbed; leg III without mastitarsala .................................. Leptotrombidium Nagayo, Miyagawa, Mitamura, and Imamura 1916

7. Coxa III with 2 or more setae; scutum with an acute posterior angle ................................ Miyatrombicula Sasa, Kawashima, and Egashira 1952

7'. Coxa III with 1 seta; scutum with broadly or deeply ‘U’ shaped posterior margin ................................................ 8

8. Coxa of gnathosome and coxae of legs striate punctate; Palpal Tarsus Formula (PTF) = 7BS (BS = strongly Barbed Setae); posterior margin of scutum narrow or broadly ‘U’ shaped ........................................ Blankaartia Oudemans 1911

8'. Coxa of gnathosome and coxae of legs distinctly punctate, never striate punctate; palpal tarsus formula = 6BS posterior margin of scutum slightly or deeply ‘U’ shaped .... Microtrombicula Ewing 1950

Eutrombicula:

The 2 most frequently occurring species of the genus Eutrombicula are E. alfreddugesi (Oudemans) and E. splendidus (Ewing). Numerous specimens of the 2 species were collected from black plates and host washing techniques. The specimens were collected throughout the year, during any warm day. Eutrombicula alfreddugesi can be taxonomically differentiated from E. splendidus by the number of dorsal setae, the former having 22, while the latter have 24-28 dorsal setae. Scutal measurements of E. alfreddugesi and E. splendidus and comparison of measurements made by previous chigger taxonomists are presented in Table 2.

Key to Florida Species of Eutrombicula

1. Three mastitarsala III; 2 mastitibiala III ........................................ 2

1'. One mastitarsala; no mastitibiala ............................................. 3
<table>
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<tr>
<th>Species</th>
<th>AW</th>
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<th>SB</th>
<th>ASB</th>
<th>PSB</th>
<th>A-P</th>
<th>AM</th>
<th>AL</th>
<th>PL</th>
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<td>25</td>
<td>33</td>
<td>32</td>
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<tr>
<td>Wofenbarger (1952)</td>
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<td>88</td>
<td>43</td>
<td>23</td>
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<tr>
<td><em>Eutrombicula splendens</em></td>
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<td>Min.-Max.</td>
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<td>87-92</td>
<td>29-44</td>
<td>18-28</td>
<td>15-33</td>
<td>15-26</td>
<td>18-33</td>
<td>22-33</td>
<td>40-48</td>
<td>44-48</td>
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<tr>
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<td>43</td>
<td>24</td>
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<tr>
<td>Jenkins (1949)</td>
<td>82</td>
<td>94</td>
<td>45</td>
<td>25</td>
<td>30</td>
<td>27</td>
<td>39</td>
<td>35</td>
<td>49</td>
<td>51</td>
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</tbody>
</table>

*Scutal measurements were taken with an ocular micrometer with all measurements expressed in microns. The standard lengths used are: AW—distance between the bases of anterolateral setae; PW—distance between the bases of posterolateral setae; SB—distance between bases of sensilla; ASB—distance from anterior margin to sensillary bases; PSB—distance from posterior margin to sensillary bases; AP—distance between bases of anterolateral and posterolateral setae; AM—length of intermedian setae; AL—length of anterolateral setae; PL—length of posterolateral setae; S—length of sensilla.
Rohani & Cromroy: Chiggers

2. Dorsal setae 50 to 54 .............................................. multivetana (Ewing 1948)
2'. Dorsal setae 32 to 38 ............................................ batatas (Linnaeus 1758)
3. Dorsum with 24 to 28 setae ....................................... splendens (Ewing 1913)
3'. Dorsum with 22 setae .............................................. alfreddugesi (Oudemans 1910)

*Fonsecia*:

The larvae of this genus are distinguished by having the PosteroLaterals (PL) greater than the AnteroMedian (AM) and the AM greater than AnteroLaters (AL). The subgenus *Paraecia* differs from the subgenus *Fonsecia* in having normal scutal setae (peg-like in the subgenus *Fonsecia*).

Only 1 species of the genus was collected. This was *gurneyi gurneyi* which belongs to the subgenus *Paraecia*. It was 1 of the most abundant chiggers collected from Berlese tree hole samples at 2 collection sites; in Alachua Co., (Gainesville area) and in Okaloosa Co., (Eglin Air Force Base area). The specimens were collected during January and April 1976. Ewing (1937) reported collecting the specimen from Blue-tailed skink (*Eumeces fasciatus*) in April. Dohany (1974) collected this species abundantly from Berlese treecole samples in Gainesville, Lakeland, and Tallahassee.

*Fonsecia* (*Paraecia*) *gurneyi gurneyi* is characterized by its small scutum; dorsal formula of 2-6-6-4-2-2-2 = 24; nude palpal genal setae and without mastitarsala of leg III. Scutal measurements of 10 specimens are shown in Table 3.

**Key to Subgenera and Species of Fonsecia**

1. Scutum with peg-like anterolateral setae; a convex posterior scutal margin; palpal tibial claw bifurcate; usually confined to reptiles .............................. *Fonsecia palmella* Brennan & Loomis 1959
1'. Scutum with normal AL setae; a sinuous posterior scutal margin; palpal tibial claw trifurcate; wide host range .............................. *Paraecia gurneyi gurneyi* Ewing 1937

*Euschoengastia*:

One species of *Euschoengastia* was collected during this study. Dohany (1974) collected 2 species from this area. Farrell (1956) conducted a detailed study of *Euschoengastia* of North America.

*Euschoengastia rubra* Farrell was obtained from Berlese treehole samples collected at the Leon Co. site, (Beech-Magnolia Hardwood Hammock, Tall Timbers) in December, 1975. This supports observations made by Farrell (1956) who recorded this species during the months of December through May and who indicated that *E. rubra* was confined strictly to the seasons when the soils were moist and colder.

*Euschoengastia rubra* can be distinguished from other species of this group by the strongly branched lateral setae on the palpal tibia and by the different shape of its scutum, with 3 joined crescentic folds; the middle 1 extending around the anterior median seta. Table 3 presents the scutal measurement of 2 specimens.

Two other species of *Euschoengastia* were reported by Dohany and Cromroy (1976). They are *E. peromysei* (Ewing) collected from *Peromyscus*
TABLE 3. SCUTAL MEASUREMENTS* OF FONSECIA (PARASECIA) GURNEYI GURNEYI (EWING) AND EUSCHONGASTIA RUBRA FARRELL.

<table>
<thead>
<tr>
<th></th>
<th>AW</th>
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<th>SB</th>
<th>ASB</th>
<th>PSB</th>
<th>A-P</th>
<th>AM</th>
<th>AL</th>
<th>PL</th>
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<tr>
<td>Fonsecia (Parasecia) gurneyi gurneyi</td>
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<tr>
<td>Average (n=10)</td>
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<td>30</td>
<td>23</td>
<td>17</td>
<td>17</td>
<td>29</td>
<td>25</td>
<td>43</td>
<td>56</td>
</tr>
<tr>
<td>Dohany (1974)</td>
<td>65</td>
<td>76</td>
<td>31</td>
<td>23</td>
<td>16</td>
<td>17</td>
<td>30</td>
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<td>Loomis (1956)</td>
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<td>16</td>
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<td>28</td>
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<td>Euschongastia rubra</td>
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<tr>
<td>Min.-Max.</td>
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<td>13-18</td>
<td>33-43</td>
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<td>33.9</td>
<td>59.9</td>
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*Scutal measurements were taken with an ocular micrometer; all measurements expressed in microns. The standard lengths used are: AW—distance between the bases of anterolateral setae; PW—distance between the bases of posterolateral setae; SB—distance between bases of sensilla; ASB—distance from anterior margin to sensillary base; PSB—distance from posterior margin to sensillary base; A—distance between bases of anterolateral and posterolateral setae; AM—length of anteromedian setae; AL—length of anterolateral setae; PL—length of posterolateral setae; S—length of sensilla.
<table>
<thead>
<tr>
<th></th>
<th>AW</th>
<th>FW</th>
<th>SE</th>
<th>ASB</th>
<th>PSB</th>
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<td>Miyatrombicula jonesae</td>
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<td>Min.-Max.</td>
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<td>55-64</td>
<td>18-22</td>
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<td>Loomis (1956)</td>
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<tr>
<td>Average (n=3)</td>
<td>57</td>
<td>66</td>
<td>26</td>
<td>24</td>
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</table>

*Scutal measurements were taken with an ocular micrometer with all measurements expressed in microns. The standard lengths used are: AW—distance between the bases of anterolateral setae; FW—distance between the bases of posterolateral setae; SE—distance between bases of sensilla; ASB—distance from anterior margin to sensillary bases; PSB—distance from posterior margin to sensillary bases; AP—distance between bases of anterolateral and posterolateral setae; AM—length of anteromedial setae; AL—length of anterolateral setae; PL—length of posterolateral setae; S—length of sensilla.
floridanus from the Gainesville area and E. setosa (Ewing) from a treehole in Gainesville collected in December, 1971.

Key to Species of Euschongastia

1. Sensillae capitate or subcapitate; palpal tibial claw 3 prongs; tibiala III present .................................................. 2

1'. Sensillae ovoid; palpal tibial claw more than 3 prongs; tibiala III absent ............................................................... setosa (Ewing 1937)

2. Scutum with 2 crescentric ridges, 1 anterior to each pseudo stigmata ................................................................. peromysci (Ewing 1929)

2'. Scutum with 3 crescentric ridges, 1 anterior to each pseudostigmas and a 3rd extending from apices of anteriorly around the AM seta ......................................................... rubra Farrell 1956

Miyatrombicula:

The subgenus Miyatrombicula Sasa, Kawashima, and Egashira 1952, was erected within the Genus Trombicula Berlese for their new species kochiensis, which was collected very commonly from western Japan (Sasa and Ogata 1953). Brennan (1952) discussed a group of 4 species of larval chiggers including Miyatrombicula cynos Ewing and 3 related new species which included M. jonesae.

Miyatrombicula jonesae Brennan was taken from treehole samples collected from Alachua Co. This species has been previously reported from Kansas (Loomis 1956) and Illinois (Brennan 1952). The collections of M. jonesae were made in February, 1976. Brennan (1952) reported collections in October, 1948.

Miyatrombicula jonesae is characterized by having 3 branched setae on coxae III, by its characteristic scutal shape, and 40 or more dorsal setae. The scutal measurements of 3 specimens of M. jonesae are presented in Table 4.

Leptotrombidium:

The genus Leptotrombidium contains species that are proven vectors of scrub typhus (Rickettsia tsutsugamushi). It was erected by Nagayo et al. (1916) with the species, Trombidium akamushi Brumpt 1910 as type of the genus. It contains 3 subgenera: Trombiculindus Radford 1948; Leptotrombidium Nagayo, Miyagawa, Mitamura, and Imamura 1916 and Erioso trombidium Vermammen-Grandjean 1966. Most of the species of Leptotrombidium currently described are restricted to Asia. Only 5 species were known from North America. Leptotrombidium peromysci Vermammen-Grandjean was added to the list of North American “Akamushi” group and to the S.E. United States.

The diagnosis of the genus Leptotrombidium Nagayo, Miyagawa, Mitamura, and Imamura as described by Nadchatram and Dohany (1974) is: Palpal tarsal formula (PTF): 7 strongly barbed galeal setae. Palpal claw strongly barbed. Usually 3-pronged. Chelicera simple with a dorsal and sometimes with a ventral tooth. Eyes 2 + 2. Scutum rectangular, sparse to densely punctate. SB either anterior or posterior of line of PL's, but always
Fig. 1. Larva of *Leptotrombidium peromysci*; (a) dorsal and (c) ventral aspects of gnathosome; (b) dorsal and ventral aspects of idiosome; (d, e, & g, respectively) legs I, II, and III; (f) scutum; HS = humeral seta; DS = dorsal seta; VS = ventral seta; CS = coxal seta.

Nearer to PL's. AM submarginal, AL's marginal. Sensillae slender with simple barbs, legs 7-7-7 segmented; 2 genualae I. No mastisetae on any of the legs.

*Leptotrombidium peromysci* Vercammen-Grandjean

(Fig. 1) Larva

Scutum rectangular; punctae small, numerous and evenly distributed; region of anterior and posterior setae bare; sensillae slender, barbed at
distal half; eyes 2 + 2, anterior eye equal in size to posterior eye; palpal claw 3-pronged; galeal setae barbed; palpal femoral and genual setae nude; dorsotibial setae barbed, dorsolateral setae nude, ventrotibial setae barbed; palpal formula N/N/NBN + 7B. Dorsal setae arranged 2, 10, 8, 4, 2, 4, 2, total of 32.

Idiosoma. Idiosoma of the unengorged larva broadly oval, 165 x 163 μ; color in life orange to creamy white. Eyes 2 + 2, anterior eyes subequal to posterior eyes in diameter; when bigger, not more than 2X; easily visible.

Gnathosoma. Well sclerotized and prominently displayed; base of chelicera sparsely punctate, its blade broad at base; cheliceral blade 33 μ long, with small sharp subapical dorsal tooth. Palpal formula N/N/NBN + 7R; nude seta long on genu; dorsotibial seta always bear more barbs (6-7) than ventrotibial (4-5); claw 3-pronged, with 2 closely appressed unequal accessory prongs. Galeal setae barbed.

Scutum. Rectangular or trapezoidal, anterior margin concave slightly, lateral margins between AL and PL straight; posterior margin shallow and slightly biconvex. Punctae medium-sized, numerous, evenly distributed in the central portion of scutum, absent in region of AM and SB line; sensillae slender with 15-16 barbs on distal half of stem; SB line to line of PL setae AM submarginal, below line of AL setae. The scutal measurements are presented in Table 4.

Body setae:

Dorsal—single pair humeral setae (HS) 55 μ; dorsal setae (DS) 40-48 μ long, arranged 2, 10, 8, 4, 2, 4, 2 = 32. HS and DS strongly ciliated.

Ventral—Ventral setae (VS) short and pectinate, arranged 2, 2, 6, 9, 2, 2, 2 (total 25); VS 29-44 μ long, posterior pairs longer, 44 μ long; sternal setae 2 + 2; 42-44 μ long.

Legs—7-7-7 segmented; segments short and strongly sclerotized. Average length 700-717 μ. Coxae I-III unisetosa. Terminal claw stout, empodia slender and longer than claw.

Leg I—251-255 μ long; tarsala blunt, 13 μ long; 2 tibiala 13-14 μ, 2 genuala 15-18 μ, subterminala and parasubterminala present.

Leg II—209-220 μ long; tarsala blunt, 15 μ long; microtarsala proximal to base of tarsala; tibia with 2 tibiala, 13-15 μ long. Genu with 1 genuala 11 μ long.

Leg III—238-242 μ long. Tiba with proximal 11 μ tibiala and 5-6 barbed setae. Genu with 1 genuala 15 μ long.

Larvae collected from tree holes in Beech-Magnolia Hammock, Tall Timbers Research Station, Leon County, FL 29-XII-1976 and on 4-111-1976 by Rohani Ibrahim.

Similar to L. myotis Ewing 1929 in having a rectangular or subcuncate scutum. Readily separable in number and arrangement of DS 2, 10, 10, 6, 6, 4 (total 38) in L. myotis (Ewing 1929) and 2, 10, 8, 8, 2, 4, 2 (total 36) in L. myotis (Wharton 1947), and 2, 10, 8, 4, 2, 4, 2 (total 32) in Leptotrombidium peromysci. Further separable from this species by dissimilarity of palpal formula N/N/NBN in myotis and N/N/NBN in peromysci.

Walchia:

Walchia americana Ewing is the only species of this genus recorded from
the New World. This species was originally described by Ewing (1942) from a cotton mouse (*Peromyscus gossypinus*) from Tallahassee, FL. It has been collected from numerous mammalian hosts. Loomis (1956) indicated that the species, like all of the members of the subfamily Walchiinae, seems to occur only on mammals. Two different habitats are associated with the species in this area. A single specimen was removed from an opossum collected in Alachua County on 29-IV-1974; Dohany (1974) collected 2 specimens from tree holes. The larvae have been taken from hosts in Kansas and other states from September to May (Loomis 1956).

*Walchia americana* can be distinguished easily by its unusual scutum, having only 4 scutal setae, 2 anterolaterals and 2 posterolaterals but always lacking the anteromedian seta; sensillae elevata. Table 4 presents the scutal measurements.

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**Literature Cited**


THE SPECIES OF DAGBERTUS
(HEMIPTERA: MIRIDAE) ASSOCIATED
WITH AVOCADO IN FLORIDA\textsuperscript{1}

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ABSTRACT

Two species of Dagbertus Distant are frequent on avocado in southern Florida: \textit{D. fasciatus} (Reuter) and \textit{D. olivaceus} (Reuter). The synonymy is elucidated and a key given for their separation \textit{inter se} and from superficially similar mirids sometimes found on the crop.

It has long been known that some Miridae (Hemiptera) may reduce yields of avocado (\textit{Persea americana}) in southern Florida: “Occasionally avocados have suffered serious crop injury from the attack of certain plant bugs known as mirids, closely related to the tarnished plant bug” (Ruehle 1958). The first to identify these members of the subfamily Mirinae was Wolfenbarger (1963), as \textit{Lygyus fasciatus} var. \textit{olivaceus} Reuter and \textit{Lygyus fasciatus} var. \textit{viridiusculus} Knight. Earlier, Bruner et al. (1945) had noted \textit{Lygyus olivaceus} on avocado in Cuba.

Kelton (1955) reviewed the genus \textit{Lygyus} Hahn, accepted the splintering of it proposed by Leston (1952) for the British species and went further in

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