

CECIDOMYIIDAE FROM PINE CONES IN FLORIDA,  
WITH A GENERIC KEY TO LARVAEBERNARD H. EBEL, RAYMOND J. GAGNÉ, AND EDWARD P. MERKEL<sup>1</sup>

## ABSTRACT

The identity of Cecidomyiidae from cones of slash (*Pinus elliottii* Engelm.) and longleaf (*P. palustris* Mill.) pines is reported. Species found were *Asynapta keeni* (Foote), *Resseliella silvana* (Felt), *Mycodiplosis thoracica* (Fitch), and *Lobodiplosis triangularis* Felt. *Resseliella silvana* and possibly *A. keeni* were associated with primary cone damage while *M. thoracica* infested diseased cones; *Lobodiplosis triangularis* is known to be a predator. An illustrated generic key to the larvae of the known southern cone-infesting midges is presented.

The identity of and damage caused by insects infesting cones of slash, *Pinus elliottii* Engelm., and longleaf, *P. palustris* Mill., pines in northern Florida indicated that larvae of the dipterous family Cecidomyiidae (= Itonididae) were among such insects (Ebel 1963). Identification of reared specimens was hampered by the uncertain taxonomic status of both genera and species. Recent studies of these insects (Gagné, unpublished) permitted specific identifications. These, together with host data and a generic key to mature larvae of Cecidomyiidae (midges) reared from cones of southeastern pines, are reported in this paper.

## IDENTIFICATIONS AND ANNOTATED HOST DATA

1. *Asynapta keeni* (Foote).—Eighty-eight adults were reared from damaged second-year cones of both slash and longleaf pines. Six collections were represented. In 4 collections this midge occurred with other midge species; in the only longleaf pine collection, it was associated with *Dioryctria* spp. coneworm damage; and lastly, it was reared from a collection of dead cones.

2. *Resseliella silvana* (Felt).—Forty-two adults of this species were reared from 5 cone collections. Three of these collections were of infested, green, second-year slash pine cones. The remaining 2 were of first-year cones infected with cone rust, *Cronartium strobilinum* (Arth.) Hedgc. and Hahn, 1 collection each from slash and longleaf pines.

In the second-year cones this midge was associated with *A. keeni* in 1 collection and in part of the cones from a second collection. In the remaining second-year cone collection it occurred alone. In the rust-infected cones another midge, *Mycodiplosis thoracica* (Fitch), was also prevalent.

3. *Mycodiplosis thoracica* (Fitch).—One hundred seventy-six adults of this midge were secured from 3 rearings. Of these, 1 was from green slash pine cones from which *A. keeni* and a single *Lobodiplosis triangularis* Felt were also reared. The others were from rust-infected first-year slash and longleaf pine cones from which all but 8 of the total specimens were reared. *Mycodiplosis* species feed on rust spores (Nijveldt 1969).

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4. *Lobodiplosis triangularis* Felt.—The single specimen of this midge was reared from a collection of green slash pine cones in association with other midge species already noted.

#### DISCUSSION AND LARVAL IDENTIFICATION

It was obvious to us from these rearings that infested cones often contain more than 1 midge species. Coulson and Franklin (1968) also reported three genera reared from shortleaf cones. One, *Mycodiplosis* (read *Res-seliella* (RJG)), occurred in our rearings, but the others, *Hyperdiplosis* and *Lestodiplosis*, did not. *Lestodiplosis* species are predators. Excluding the predacious *Lestodiplosis* and fungus-feeding *Mycodiplosis*, the roles in cone damage of the other 4 genera discussed here are uncertain. From our rearings it would seem most likely that *R. silvana* is a primary insect. *A. keeni*, reported by Keen (1958) as a resin feeder, seems more likely to be a secondary insect or one that requires prior injury to a cone to become established and possibly extend such damage. Its frequent occurrence in collections of slash pine second-year cones in Louisiana is considered by Kucera (1973 unpublished, personal communication<sup>2</sup>) as indicative of its ability to be a primary cone-infesting insect. *L. triangularis*, represented by 1 specimen only, seems unlikely to be a major cone-damaging species. *Hyperdiplosis* was, as previously noted, not present in our rearings.

Since the rearings were made, we have become aware that larvae of these midges are distinguishable. Identification of such larvae, taken from green cones in which their damage is readily recognized (Fig. 1), would provide a more reliable means of attributing damage to a particular midge genus or species. To this end the following key to the larvae of those midges reared this far from southern pine cones was prepared. The list of technical terms immediately following the key, in conjunction with Fig. 8, should facilitate the use of the key. Direct comparison of the terminal body segments of specimens to Fig. 2-7 may also be useful for tentative identification of unknown larvae.

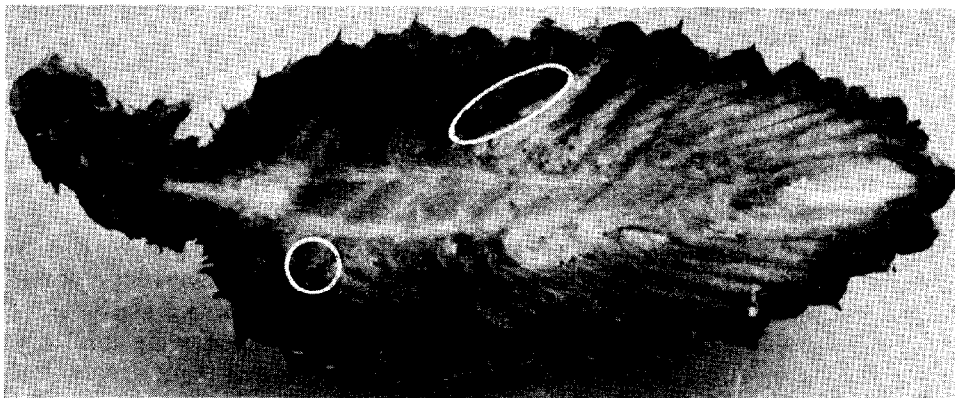
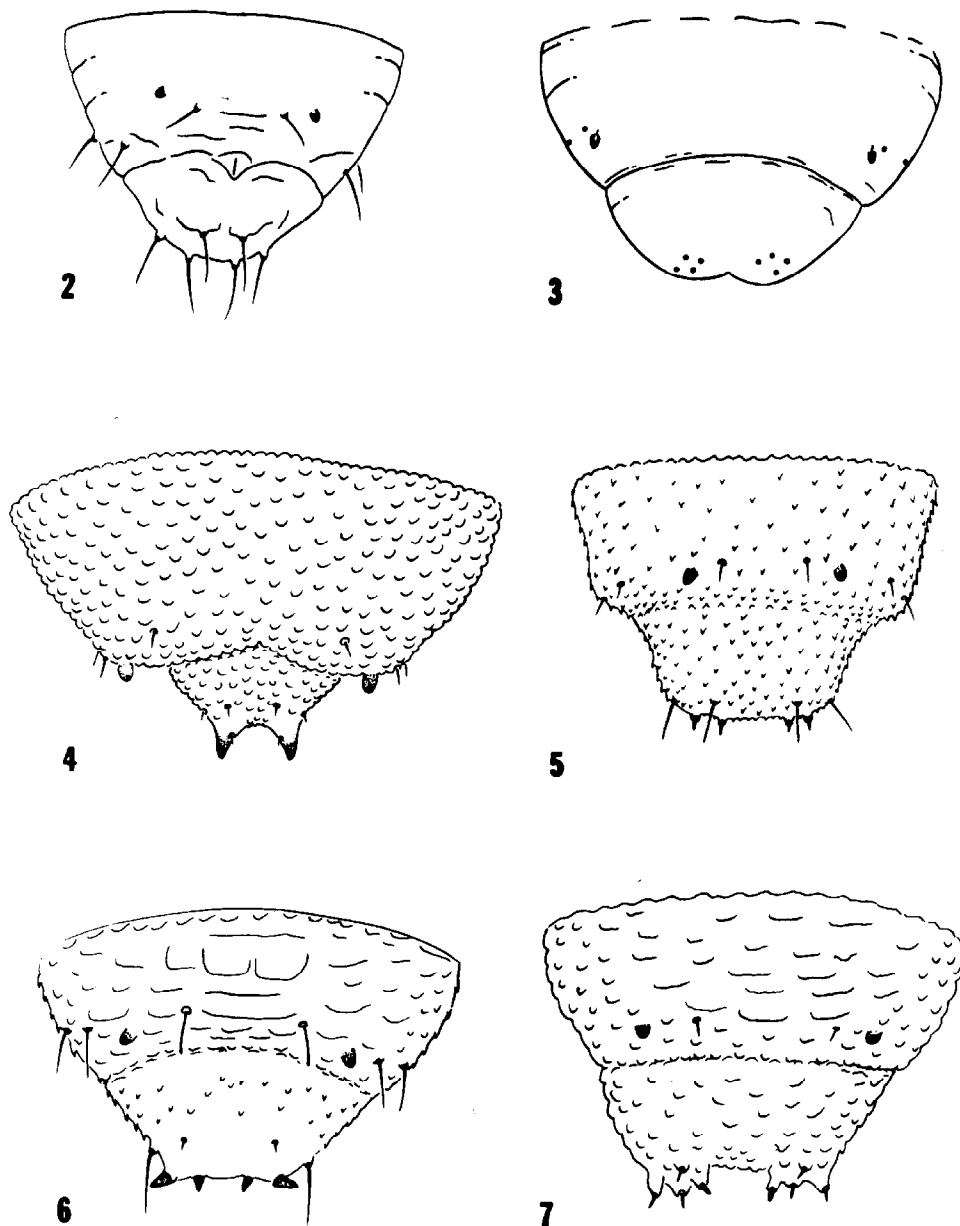


Fig. 1.—Typical cecidomyiid damage to a second-year slash pine cone. Similar resinous cavities occur in midge-damaged first-year cones including those infected by cone rust. Larvae between cone scales are small, 3-4 mm long, and usually yellow to orange in color.

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KEY TO LAST-INSTAR LARVAE OF CECIDOMYIID GENERA  
ASSOCIATED WITH CONES OF SOUTHERN PINES

1. Terminal abdominal segment with 8 papillae (Fig. 3-7);  
these either with heterogeneous setae or without setae; ventral  
pseudopods absent; anus ventral; sternal spatula usually



Figs. 2-7.—Terminal body segments (dorsal view) of known pine cone-infesting genera of Cecidomyiidae larvae of the southeastern United States. 2) *Lestodiplosis*, 3) *Asynapta*, 4) *Resseliella*, 5) *Mycodiplosis*, 6) *Clinodiplosis* or *Hyperdiplosis*, and 7) *Karschomyia* or *Lobodiplosis*, (redrawn from *K. aceris* Mamaev figure of Mamaev and Krivosheina (1965)).

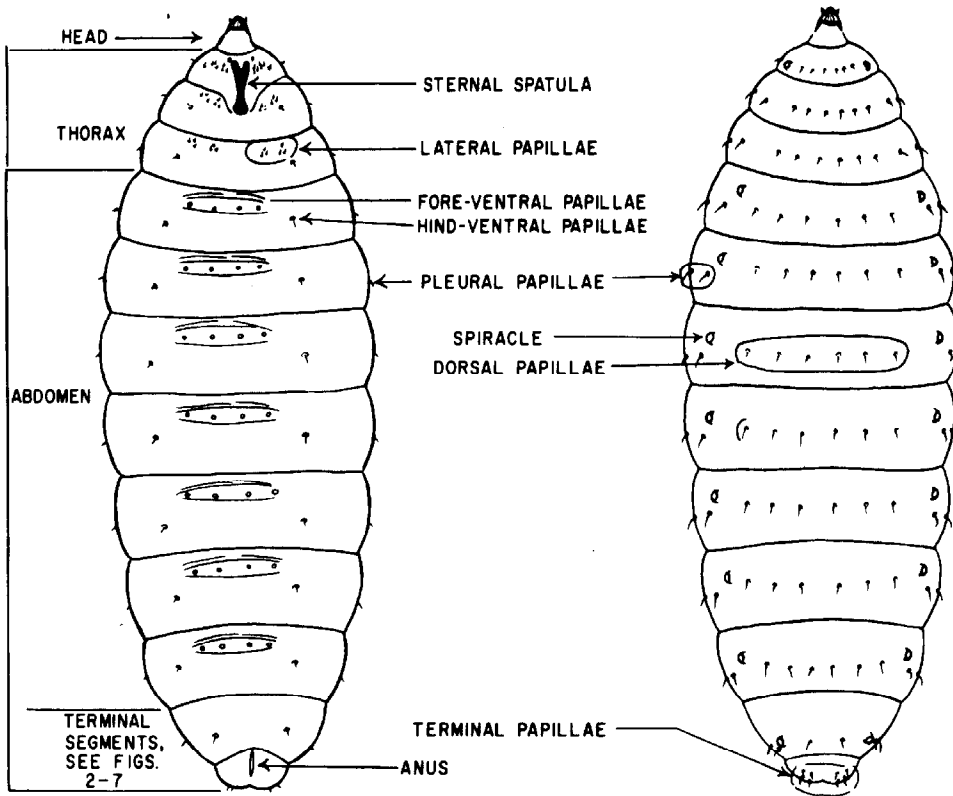


Fig. 8.—Generalized cecidomyiid larva; A. Ventral view. B. Dorsal view.

- present (a clove-shaped, sclerotized structure on venter of thoracic segment I) ..... 2
- 1'. Terminal abdominal segment with 6 papillae with uniformly long setae (Fig. 2); ventral pseudopods present: 2 each on thoracic segments II and III, 3 each on abdominal segments I-VII; anus dorsal; sternal spatula absent ..... *Lestodiplosis*
- 2. Sternal spatula present; abdominal segment VIII with 2 dorsal papillae (those papillae located on the dorsum between the spiracles); terminal papillae setose or corniform; integument verrucose, pebbly, or spinose ..... 3
- 2'. Sternal spatula absent; abdominal segment VIII with 4 usually imperceptible dorsal papillae; terminal papillae without spines; integument smooth (Fig. 3)..... *Asynapta*
- 3. Terminal abdominal segment bifid, the 2 dorsally projecting tips formed by a pair of corniform, terminal papillar setae; remaining 6 terminal papillae setiform (Fig. 4); integument uniformly pebbled ..... *Resseliella*
- 3'. Terminal abdominal segment entire or nearly so; integument not uniformly pebbled ..... 4
- 4. Papillar setae of terminal abdominal segment in 2 uniform series of 4 each; 4 short, corniform; 4 long, setiform (Fig. 5)....  
..... *Mycodiplosis*

- 4'. Papillae of terminal abdominal segment not in 2 uniform series of 4 each ..... 5
5. Four terminal papillae short, corniform; 2 long, setiform; and 2 short, setiform (Fig. 6) ..... *Clinodiplosis* & *Hyperdiplosis*
- 5'. Terminal papillae all of approximately same length, only 2 corniform (Fig. 7) ..... *Karschomyia* & *Lobodiplosis*<sup>3</sup>

#### Explanation of Key Terms

Corniform—stout, conical.

Papillae—integumental sense organs, usually terminated by a seta.

Pseudopods—soft foot-like appendages, not segmented as are true legs.

Verrucose—covered with wart-like prominences.

#### LITERATURE CITED

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<sup>3</sup>The larva of *Lobodiplosis* is unknown but is expected to resemble that of *Karschomyia* because of the congruence of adult characters.

