

## BRIEF NOTE

ESTIMATING NYMPHAL POPULATIONS OF 17-YEAR CICADAS IN EASTERN OHIO, 1968.<sup>1, 2</sup>

Observations were made from mid-July to early August in five large orchards (40 to 200 acres each) and in three oak forests located within a 56 km circle covering Columbiana, Mahoning, and Trumbull Counties. *M. septendecim* (L.) and *M. cassini* (Fisher) were present in all locations, except for the forest at Mineral Ridge (Trumbull County) where only *M. septendecim* was found. The orchards had apple trees generally 30 to 40 years old and peach trees from 20 to 25 years old.

I randomly selected ten 1 ft<sup>3</sup> (0.093 m<sup>3</sup>) samples by tossing a frame onto the ground. This procedure was repeated under five trees in each orchard and three trees in each forest. All samples were obtained under the foliated crown of the tree, not closer than 0.5 m from the crown periphery or tree trunk. After the litter and sod were carefully removed, nymphal emergence holes were counted.

The radius of the foliar canopy of each fruit tree was also estimated in order to calculate the cicada density per tree. The number of cicadas per acre of orchard was computed from an observed average of 40 apple or 60 peach trees per acre.

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<sup>2</sup>Research conducted while employed by Department of Entomology, Ohio Agricultural Research & Development Center, Wooster.

Populations in forests were based on number of square feet per acre.

Cicada densities ranged from 52 to 500 × 10<sup>3</sup> per acre in the apple orchards (table 1). These population estimates

TABLE 1  
Density of 17-year cicadas in eastern Ohio, 1968.

Location	Emergence holes per*	
	ft <sup>2</sup> (.093 m <sup>2</sup> ) tree × 10 <sup>3</sup>	
ORCHARDS		
Canfield	24.5 ± 14.1**	12.5
Columbiana	4.9 ± 6.5	1.3
New Waterford-A	18.3 ± 11.5	4.8
New Waterford-B	7.6 ± 8.4	4.3
New Waterford-C	11.4 ± 12.6	4.0
average	13.3 ± 13.1	5.4
OAK FORESTS		
Clarkson	8.1 ± 16.7	
Gavers	1.1 ± 1.7	
Mineral Ridge	4.5 ± 5.9	
average	4.6 ± 10.6	

\*Orchard samples were restricted to under the foliar canopy of the trees; 50 samples were taken in each orchard, and 30 in each oak forest.

\*\*Mean ± SD.

are less than the 1.3 × 10<sup>6</sup> cicadas per acre of orchard estimated by Cory and Knight (1937) and calculated by Dybas and Davis (1962) from the data of Graham and Cochran (1954). In both references noted above, no details on sampling procedures were given and a density of 30 to 32/ft<sup>2</sup> over the entire orchard was assumed. If I assumed emergence from

every square-foot of orchard, my population estimates would range from  $213 \times 10^3$  to  $1.1 \times 10^6$  cicadas per acre. Nymphs, however, usually do not emerge between trees either in the rows or in the sprayer paths. Thus a more accurate estimate of cicadas per acre of orchard should incorporate numbers of nymphal emergence holes found beneath the foliar canopy and tree density.

My calculations show 48 to  $353 \times 10^3$  cicadas per acre of forest. These data are similar to the numbers calculated per acre in nearby orchards. However, the density of cicadas under apple trees ( $13.3/\text{ft}^2$ ) was significantly greater than the density in oak forests ( $4.6/\text{ft}^2$ ) (Student's *t* test,  $t = 5.823$ ,  $df = 338$ ;  $p < 0.01$ ).

The maximum emergence holes per square-foot were 70 (Canfield orchard) and 84 (Clarkson forest). Also recorded at Canfield was a maximum of  $26.1 \times 10^3$  cicadas per apple tree, which is similar to values noted by Gossard (1914) and Hamilton (1961). Under five peach trees (50, 1  $\text{ft}^2$  samples) at the New Waterford-C orchard, there was a mean of 1.8 holes/ $\text{ft}^2$  and 600 per tree (maximum of 8/ $\text{ft}^2$  and  $1.2 \times 10^3$  per tree). There was a significant difference between apple and peach cicada density in this orchard, ( $p < 0.01$ ). This difference was expected because the available ovi-

positional surface area on peach trees was probably much less than on apple trees when the eggs were laid 17 years ago. The population of cicadas in the peach orchard was about  $36 \times 10^3$  per acre.

Nymphal emergence holes of 17-year cicadas, *Magicicada* spp., averaged 4.6/ $\text{ft}^2$  (0.093  $\text{m}^2$ ) in three oak forests and 13.3/ $\text{ft}^2$  under the foliar canopy of apple trees in five orchards in eastern Ohio, 1968. Maximum nymphal populations ranged from  $353 \times 10^3$  per acre ( $872 \times 10^3$  per hectare) of forest to  $500 \times 10^3$  per acre ( $1235 \times 10^3$  per hectare) of apple orchard.—H. Y. FORSYTHE, JR. *Department of Entomology, University of Maine, Orono 04473.*

#### LITERATURE CITED

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