

# EFFECT OF SUN-EXPOSURE ON EMERGENCE OF 17-YEAR CICADAS<sup>1</sup>

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**Abstract.** Nymphs of 17-year cicadas, *Magicicada* spp., emerged from the soil on the south side of apple trees about 2 to 5 days before emergence on the north side and in the interior of nearby woods in northern Ohio. Cicadas began to emerge 2 to 3 days after 50% of the nymphal population showed black prothoracic markings. Development of two large black spots on the prothoracic dorsum of nymphs in a field, and their emergence, occurred one day prior to that of nymphs on the south side of apple trees. The appearance of the black spots indicates that nymphs are ready to emerge from the soil.

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Although it is generally known that nymphs of 17-year cicadas, *Magicicada* spp., will emerge earlier in sun-exposed locations than in shaded places (Andrews 1921; Beamer 1931; Marlatt 1907), few detailed data on the time lapse are available. Leonard (1964) related soil temperatures under an apple tree to nymphal development and emergence, but did not present data on numbers of nymphs or adults observed. Reported here are data collected in 1965 and 1968 in northern Ohio on the development and emergence of nymphs from soil in locations with different degrees of sun-exposure.

## MATERIALS AND METHODS

Nymphal emergence under the foliar canopy of apple trees was determined in 1965 by placing ordinary screen-mesh cages at 0.3, 0.9, and 1.5 m north and south from the trunks of each of two 30- to 40-year old, moderately pruned apple trees in Wayne County. Tree branches extended about 2.1 m from the trunk. An additional study was conducted with cages placed at 2.1 m north and south of the trunk of another large apple tree (replicated twice). The 0.6 m high cages were embedded into the sod on May 22 with 7.6 cm metal strips projecting beyond the 0.2 m<sup>2</sup> open base. At intervals of 2 to 3 days throughout the emergence period, new adults found in each cage were recorded.

In 1968 the effects of sun-exposure on cicada emergence was studied primarily in Columbiana County in two commercial apple orchards, one

field in which an old orchard was removed in the fall of 1967, and four oak woods (two woods were located in Jefferson County). All sites were within 48 km of each other; the field was adjacent to one of the orchards. Nymphs, uncovered in 2 to 6, 28.3 dm<sup>3</sup> soil and sod samples at each location on each date, were examined for development of two large dark spots on the prothoracic dorsum. Samples were taken in the orchards mid-way between the tree trunk and periphery of the foliar canopy (on the north and south sides of 30- to 40-year old apple trees), 1.3 m from places in the field where trunks had been growing the previous year; and 1.3 m from trunks of large oak trees located at least 30 m from the border of woods. *M. septendecim* (L.) and *M. cassini* (Fisher) were found in the woods; only *M. septendecim* was present in the orchards and field.

## RESULTS AND DISCUSSION

Searching for more reliability in predicting cicada emergence, Leonard (1964) estimated that darkening of the two spots on the prothoracic dorsum of nymphs appears complete (black) about 3 to 4 days before emergence. Since I observed the first adult on 29 May 1968 in the field and on May 31 and June 1 in the orchards and woods, respectively, it appears that cicadas begin to emerge 2 to 3 days after 50% of the nymphal population shows black prothoracic markings (fig. 1). Nymphs with black spots were first detected 6 to 8 days before adult emergence. The first development of spots (tan) occurred on May 20 in woods and on the north side of apple trees; 4 to 5 days later black spots were noted.

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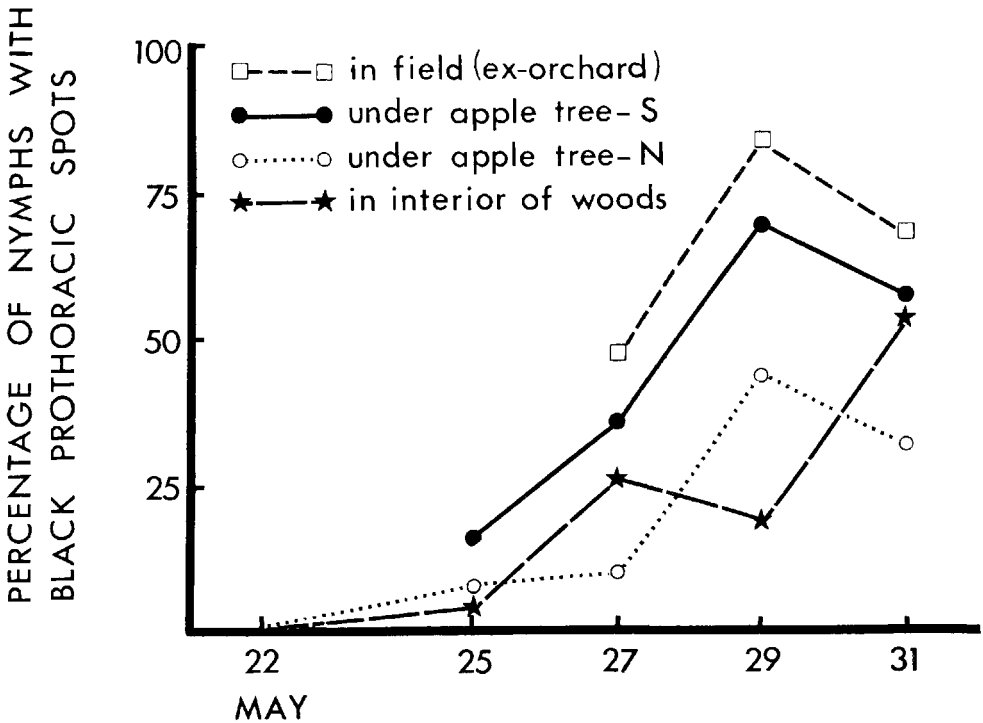


FIGURE 1. Seasonal development of two black spots on the prothoracic dorsum of 17-year cicada nymphs in different environments in Columbiana and Jefferson Counties, Ohio in 1968. Approximately equal numbers of nymphs with tan spots and with no markings were recorded at each sampling date in each location.

The data suggest that the greater the exposure of the soil to sunlight, the earlier the development of black prothoracic spots, and the sooner adults appear (fig. 1). There were differences in development and emergence of one day between cicadas in the field and those on the south side of apple trees, and of 2 to 3 days between the south and north sides of mature apple trees. Nymphal development progressed at a similar rate for populations on the north side of apple trees and in the interior of nearby woods. Leonard (1964) also indicated a delay of three days between the two sides of apple trees, but suggested that a 10-day delay occurred between orchards and woods.

In 1965 the first and peak emergences of cicadas on the south side of apple trees occurred five days before the corresponding emergences on the north side (fig. 2). There were no differences in these trends

at 0.3, 0.9, or 1.5 m from the tree trunks. In the study with cages placed 2.1 m from the trunk, the delay in emergence on the north side was about seven days.

The data in figure 2 suggest that more cicadas emerged from the south side of trees than from the north side (Student's t test,  $P < 0.05$ ). There were 117.0, 47.5, and 16.0 adults recorded per 0.2 m<sup>2</sup> at 0.3, 0.9, and 1.5 m south of the trunks, respectively; comparative averages on the north side were 48.5, 13.0, and 13.5 adults. It also appears that progressively more cicadas are present closer to the tree trunks. In the study with cages at 2.1 m, 43 adults per 0.2 m<sup>2</sup> emerged south of the tree trunk and 22 emerged on the north.

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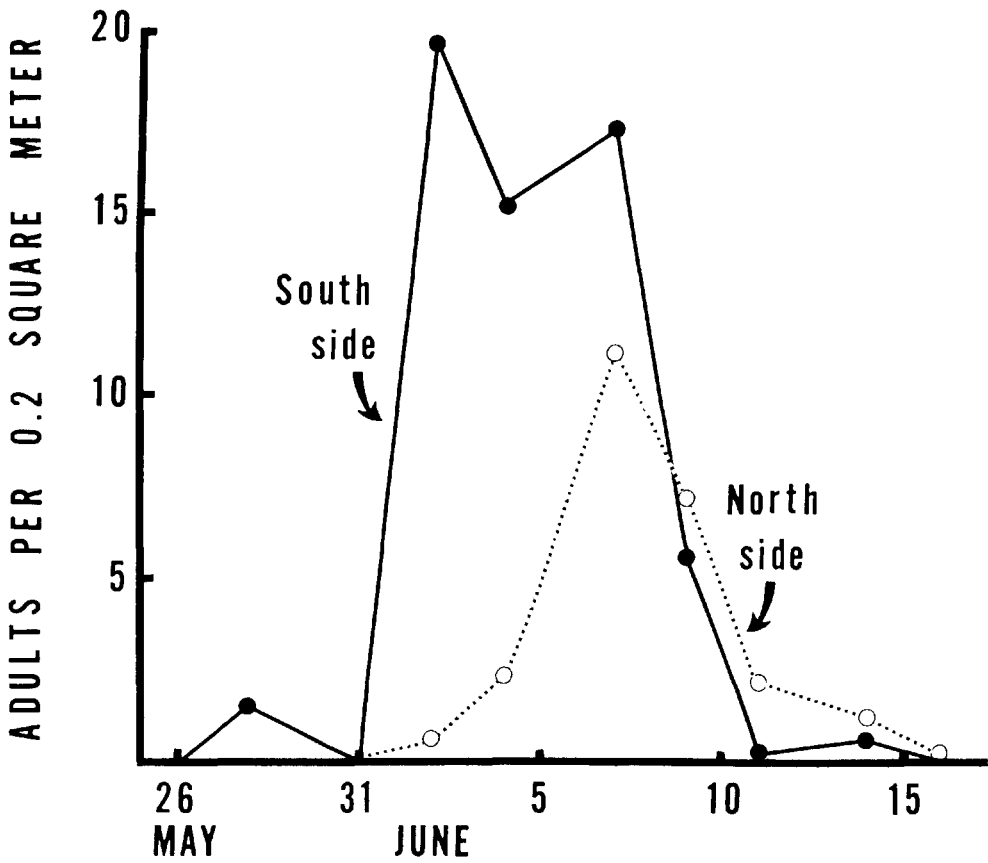


FIGURE 2. Seasonal appearance of 17-year cicada adults on the south and north sides under apple trees in Wayne County, Ohio in 1965. Cages were located 0.3, 0.9, and 1.5 m from the tree trunks.

#### LITERATURE CITED

- Andrews, E. A. 1921 Periodical cicadas in Baltimore, Md. *Sci. Monthly* 12: 310-320.
- Beamer, R. H. 1931 Notes on the 17-year cicada in Kansas. *J. Kansas Entomol. Soc.* 4(3): 53-58.
- Leonard, D. E. 1964 Biology and ecology of *Magicicada septendecim* (L.) (Hemiptera: Cicadidae). *J. New York Entomol. Soc.* 72: 19-23.
- Marlatt, C. L. 1907. The periodical cicada. *USDA Bur. Entomol. Bull.* (n.s.) 71. 181 p.