BRIEF NOTE

The 1987 Emergence of the Periodical Cicada (Homoptera: Cicadidae: *Magicicada* spp.: Brood X) in Ohio[1]

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ABSTRACT. Brood X of the periodical cicadas emerged in parts of western Ohio during late May and June, 1987. Periodical cicadas were reported in 26 counties in western Ohio, including three new county records. The 1987 distribution was compared to the historical record of periodical cicadas in Ohio, revealing that the distribution of Brood X has been greatly reduced in the last century and that 12 counties have witnessed 4-year accelerations of the 17-year life cycle.

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INTRODUCTION

Brood X of periodical cicadas emerged in parts of western Ohio during late May and June, 1987. The three species of periodical cicadas, *Magicicada septendecim*, *M. cassini*, and *M. septendecula*, were collected. Records of this brood in Ohio date back to 1804, and 39 counties have recorded these cicadas during years of Brood X emergences. This year, 23 of those 39 counties were reconfirmed and three new county records were reported (Fig. 1).

MATERIALS AND METHODS

Seven stations on the campus of the College of Mount St. Joseph in western Cincinnati were used to monitor emergence phenology. Once cicada activity was reported, the stations were checked daily.

To verify the distribution of periodical cicadas in Ohio, letters giving the previous history of Brood X were sent to county extension agents in all counties in which Brood X had been reported. The letters asked the extension agents to report whether periodical cicadas were being observed in their county and, if the periodical cicadas had been observed, to give specific emergence localities.

RESULTS

The periodical cicada phenology in western Cincinnati in 1987 was as follows. On 20 April there was turret construction. Emergence began on 15 May with *M. cassini* and *M. septendecula*. Cool temperatures on 15 and 16 May apparently delayed the emergence of all three species until 18 May. During the heaviest emergence over 50 adults per m^2 were observed. Emergence of adults was nearly complete by 27 May when only three newly emerged *M. cassini* were found. The last teneral adult *M. cassini* was seen on June 9. Chorusing was heard throughout June; the last singing male *M. cassini* was heard on 27 June.

The 100% response of all county agents to the letters provided the most complete coverage of Brood X in Ohio since 1919 (Anon. 1936). The emergence was the heaviest in southwestern Ohio where Hamilton, Montgomery, Preble, Clark, and Logan counties reported extensive emergences (Fig. 1). Scattered emergences were seen in Butler, Clermont, Adams, Warren, Greene, Fayette, Pickaway, Fairfield, Franklin, Madison, Darke, Shelby, Auglaize, Union, Delaware, Morrow,

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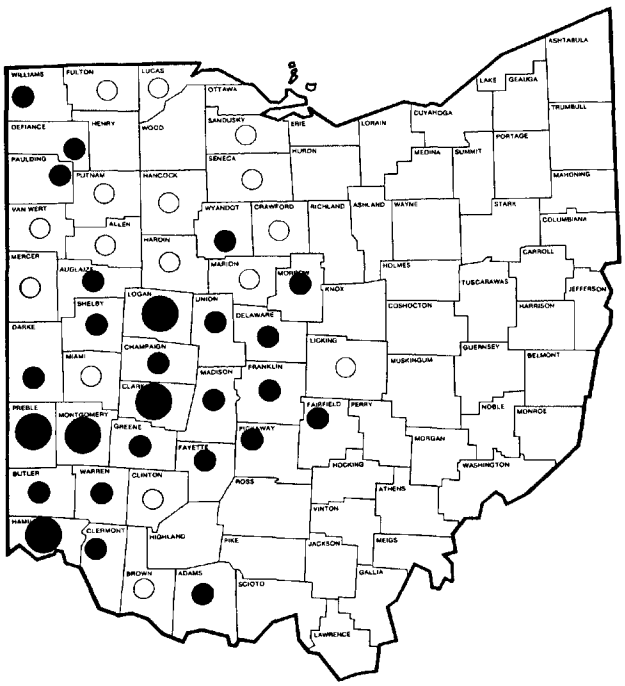

FIGURE 1. Distribution of periodical cicadas in Ohio during 1987. Dark circles occur in counties reporting emergences; larger circles represent heavier emergence than smaller circles. Open circles represent counties where periodical cicadas had been recorded in the past, but were not reported in 1987.

and Wyandot counties. All counties and towns reporting cicadas are presented in the Appendix. Periodical cicadas were also collected in the northwestern part of Williams County, the southeastern portion of Defiance County, and the northeastern portion of Paulding County. These are the first records of periodical cicadas from Williams and Defiance counties and the first record of Brood X in Paulding County.

DISCUSSION

The distribution of Brood X in Ohio has been greatly reduced during the past century. This reduction is the likely result of agricultural practices (Young 1971) and of 4-year accelerations of the 17-year life cycle (Lloyd and White 1976). Both events can reduce the emerging population of periodical cicadas in a given area to the point at which they cannot satiate predators, leaving too few adults to produce another generation. Four-year accelerations have been documented in Illinois and Indiana (Dybas 1969, Young 1971), and models for acceleration have been proposed (Lloyd and White 1976, Lloyd et al. 1983, Lloyd 1984). Four-year accelerations of Brood X in Ohio may be common. In 1983, a considerable number of periodical cicadas were taken at Spring Grove Cemetery in Cincinnati (Lloyd 1984). A search of historical records of periodical cicadas in the Greater Cincinnati region as well as interviews with entomologists revealed records of 4-year accelerations in 1898, 1932, and 1966 (Marlatt 1898, R. Crouch pers. comm.). Each of these emergences was apparently too small to establish a new brood.

Throughout the state of Ohio, there have been 12 counties that have apparently witnessed 4-year accelerations of Brood X. Champaign, Delaware, Hamilton, Madison, Montgomery, Pickaway, Shelby, and Union counties recorded periodical cicadas in 1898 (Marlatt 1898, Anon. 1937). Allen, Auglaize, Paulding, and Van Wert counties recorded periodical cicadas in 1932 (Anon. 1932).

The accuracy of the historical records of periodical cicadas is a matter of concern. Reports of periodical cicadas in Ohio counties during years when they were not predicted have led some investigators to question these unexpected reports. However, in the light of 4-year accelerations these records are not surprising. In Ohio, the only counties that have recorded periodical cicadas four years before Brood X are the northeastern counties, where Brood V occurs, and the western counties, where Brood X occurs. It is likely the records from Brood V counties represent periodical cicadas from Brood V which emerged a year late. The emergence of periodical cicadas after 18 years has been documented by White and Lloyd (1979). All the other unexpected records of periodical cicadas are from Brood X counties. If all of these records were based on misidentified periodical cicadas, the overlap would not be expected to be only with Brood V and Brood X counties, but also in other parts of Ohio where other broods of cicadas occur. Moreover. I have identified specimens as periodical cicadas which were taken in 1898 and 1983 from Hamilton County, indicating that these unpredicted emergences were indeed periodical cicadas.

The 1987 distribution of Brood X in Ohio combined with the historical record indicates that 4-year accelerations may be common events. Determination of the role of 4-year accelerations in the distribution of the other broods in Ohio will require that accurate distributions be determined for Brood XIV in 1991, Brood V in 1999, and Brood VIII in 2002. These distributions, combined with the historical record of periodical cicadas, will reveal more of how the periodical cicada broods evolved in Ohio.

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APPENDIX. Counties and cities reporting Brood X emergences. **Adams:** West Union; **Auglaize:** Wapakoneta; **Butler;** Oxford, Ross; **Champaign:** North Lewis, Rosewood; **Clark:** Forest Hills, Lawrenceville, Springfield, St. Paris; **Clermont:** Batavia, East Batavia Heights, Milford; **Darke:** New Madison; **Defiance:** Ayersville; **Delaware:** Concord Twp., Harlem, Kilbourn, Liberty, Powell; **Fairfield:** Canal Winchester; **Fayette; Franklin:** Columbus, Dublin; **Greene:** Yellow Springs; **Hamilton:** Addyston, Blue Ash, Bridgetown, Cheviot, Cincinnati, Cleves, Delhi, Dent, ELizabethtown, Fairfax, Forest Park, Goshen, Greenhills, Harrison, Loveland, Mariemont, Montgomery, Mount St. Joseph, Mt. Airy, Mt. Healthy, North College Hill, Sharonville, St. Bernard, Willowville; **Logan:** Bellafontaine, East Liberty, Middleburg, Rushylvania, West Mansfield, Zanesfield; **Madison:** West Jefferson; **Montgomery:** Centerville, Dayton, Miamisburg, Trotwood, Vandalia, West Carrollton; **Morrow:** Cardington, Marengo; **Paulding:** NE corner; **Pickaway:** Orient; **Preble; Shelby:** Fort Loramie, Newport, Russia, Sidney; **Union; Warren:** Fort Ancient; **Williams:** northeast part of county; **Wyandot.**

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