Observations on Periodical Cicadas (Brood X) in Indiana in 1970 (*Homoptera-Cicadidae*)[1]

Frank N. Young
Zoology Department
Indiana University, Bloomington, Indiana 47401

Abstract

Emergence of Brood X of periodical cicadas, *Magicicada septendecim*, *M. cassini*, and *M. septendecula* occurred widely over southern Indiana in May and June 1970, but was restricted in the northern parts of the state. In Monroe County, Indiana, the period of emergence was 11 days or less in any one place, but emergence in different areas began about May 14 and ended about June 2. Emergence was earlier on the edges of woods and later in densely shaded areas. Observations outside Indiana suggest that Brood X may now be divided into three isolated areas.

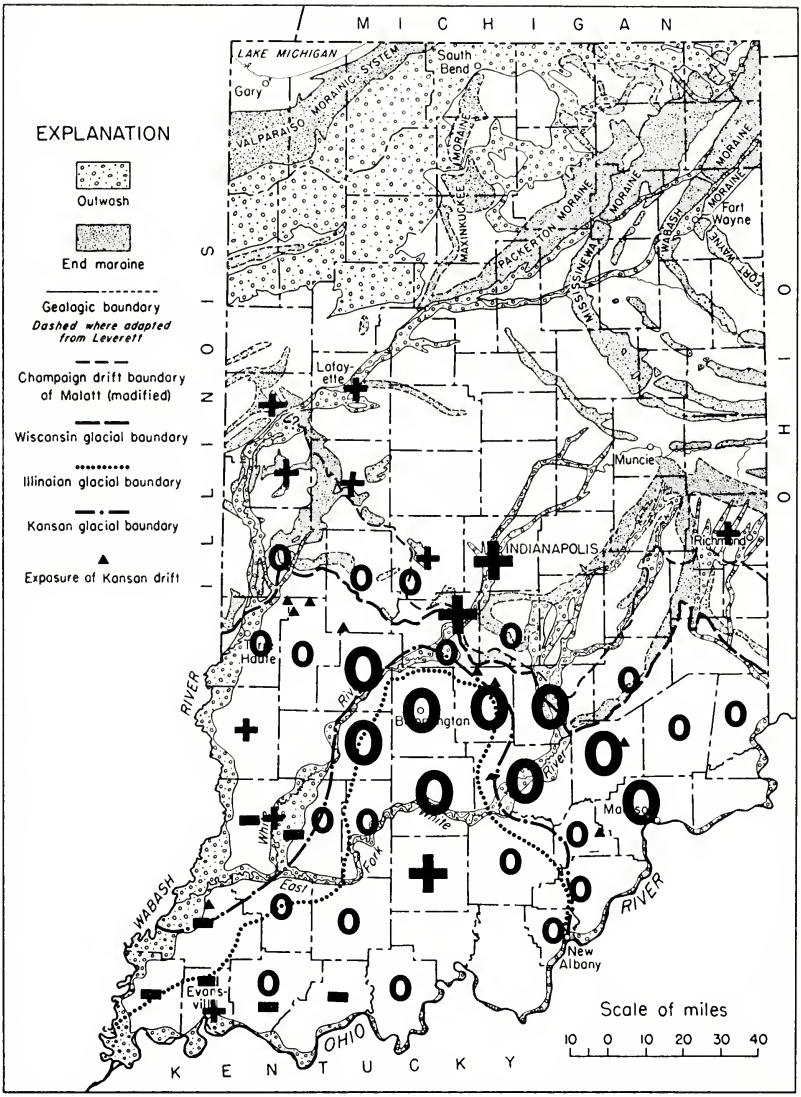
Periodical cicadas of Brood X (*Magiciada septendecim* L., *M. Cassini* Fisher, and *M. septendecula* Alexander & Moore) emerged in large numbers in southern Indiana during late May and early June, 1970. This brood has previously been reported from every county in Indiana, but the 1970 emergence indicates that there has been a considerable reduction since 1953 when it was reported widely over the state.

The accompanying map summarizes the observations and available reports of emergence. Scattered emergence over the northern part of the state probably occurred but was not reported. Emergence was general over the southern third of Indiana and was equal to or greater in magnitude than the emergence in 1953 in at least 10 counties (Owen, Greene, Monroe, Brown, Bartholomew, Lawrence, Orange, Jackson, Jennings, and Jefferson).

All three 17-year species were collected in Monroe, Brown, Jackson, Greene, Dubois and Jefferson Counties by the writer and in Orange County by Don W. Hamilton. In other counties (marked with a small **o** on Figure 1) *M. septendecim* and *M. cassini* were collected or observed.

An attempt was made to determine whether Brood X occurred in the same localities in which the 13-year Brood XXIII emerged in 1963. Twelve stations at which *Magicicada tredecim* Walsh and Riley, *M. tredecassini* or *M. tredecula* Alexander and Moore were observed in 1963 were revisited. All were negative, not only at the time of emergence, but also later showed no evidence of oviposition. These stations were in the White River and Wabash valleys generally in Knox, Daviess, Gibson, Posey, Warwick, and Spencer counties. Emergence of Brood X occurred in southern Vanderburgh (M. W. Denner, personal communication), Warwick, Daviess, and in eastern Knox counties (R. E. Dolphin, personal communication), but in localities other than those in which Brood XXIII was observed in 1963. It seems probable that the 17-year and 13-year broods do not occupy the same habitats although they intermesh with one another.

[1] Contribution No. 851 from the Zoological Laboratories at Indiana University.



Mop of Indiono showing glocial boundories and Wisconsin moroines. By William J. Woyne, 1956; in port from Leverett ond Toylor, 1915, pl. 6; Thornbury, 1937, fig. 8; ond Thornbury, in preparotion. (From Ind. Dept. Conserv., Geol. Survey, Report of Progress No. 7, fig. 2)

FIGURE 1. *Map of Indiana showing general distribution of periodical cicadas (Brood X) in Indiana in 1970.* **O** *indicates a major emergence over most of county,* **o** *indicates scattered emergence in county,* **+** *indicates major emergence reported,* **+** *indicates scattered or light emergence reported,* **—** *indicates areas checked for emergence of Brood X in areas where Brood XXIII of 13-year cicadas emerged in 1963. (Map courtesy of Indiana Geological Survey.)*

The time of emergence was generally earlier than in 1953. Near Bloomington (Monroe County) the first adults were observed on May 14 (Mrs. D. G. Frey, personal communication). Emergence on the Indiana University campus began on May 18. The first "chorus" was heard on the I.U. campus on May 20, and south of Bloomington on May 21 (Mrs. D. G. Frey, personal communication).

Daily observations and collections were made at eight locations on the I.U. campus from May 19 through May 29 when the emergence ended. All three of the species of *Magicicada* emerged on the campus, but *M. septendecula* occurred only in very low numbers as was true in 1953. On each morning, all newly emerged adults which could be found were collected in each area except in Area 4 where during the height of the emergence collecting was restricted to ½ hour. Each area was approximately 10 by 20 m. Study locations are as follows:

Area 1. A fragment of mature forest, predominantly beech and maple, shaded by buildings on the east and west (Jordan and Myers halls). Essentially flat, well drained. This and all areas except 7 and 8 not compacted by cross-walks or other traffic. Tree shade heavy.

Area 2. Cleared area (lawn) shaded on west by low temporary building. Well drained. Tree shade light. Emergence primarily around large beech trees.

Area 3. Part of mature forest fragment on gentle north-facing slope, predominantly mature beech-maple with understory of pawpaw and a few other shrubs and vines. Well drained. Emergence heaviest along open south edge. Tree shade moderate.

Area 4. Area of mixed forest on either side of small temporary stream. Drainage in part poor. Tree shade heavy. Emergence heaviest along open south edge.

Area 5. Area within mature beech-maple forest fragment on gentle south-facing slope (central quadrangle of campus). Understory of pawpaw and other shrubs. Drainage good. Tree shade moderate to heavy.

Area 6. Area at edge of mature beech-maple forest fragment on either side of a temporary stream (central quadrangle of campus). Understory of pawpaw and other shrubs. Drainage generally good. Tree shade moderate to heavy. Emergence heaviest along open eastern edge.

Area 7. Lawn area immediately east of 6. Area compacted by mowing and foot traffic. Drainage good. Tree shade light. Emergence mainly around large beech trees.

Area 8. Area on either side of walkway without grass. Soil compacted and with some added gravel. Drainage probably good. Partly shaded on south by low temporary building. Tree shade moderate. Emergence around a few living and some dead trees (beech and cherry).

Table 1 shows the pattern of emergence in the areas listed above. In addition to the collections recorded in Table 1, *Magicicada septendecula* was collected once in Area 3 and a few times at other locations on the campus. It was also locally abundant at a number of sites elsewhere in Monroe County.

Magicicada cassini emerged most abundantly in a relatively poorly drained area along either side of a small temporary stream (Table 1). This also checks with observations made in other counties where *M. cassini* was characteristically found more frequently along streams

and *M. septendecim* and *M. septendecula* more frequently on well-drained sites (1).

TABLE 1. *Record of emergence of* Magicicada septendecim *and* M. cassini *listed in 2-day intervals for selected areas of Indiana University Campus, Bloomington, Indiana.*

		Dates of Emergency (May, 1970)							
Area	Species[1]	18-19	20-21	22-23	24-25	26-27	28-29	Total	Density[2]
1	S	0	15	24	25	4	3	71	.35
	C	0	0	3	1	0	0	4	.02
2	S	13	13	14	7	0	0	47	.35
	C	1	2	2	2	0	0	7	.03
3	S	0	42	20	16	3	5	86	.43
	C	0	0	1	2	0	0	3	.01
4	S	24	21	44	16	14	4	123	.61
	C	79	121	209	71	51	5	536	2.18
5	S	12	42	64	32	70	24	244	1.22
	C	1	0	4	18	0	0	23	.11
6	S	30	11	55	133	6	57	295	1.47
	C	0	0	1	2	0	0	3	.01
7	S	0	40	93	53	6	5	197	.98
	C	0	3	11	2	4	0	20	.10
8	S	0	17	38	6	0	0	61	.30
	C	0	11	32	12	0	0	55	.27
Total	S	79	201	325	291	103	98	1124	.70
	C	81	137	263	110	55	5	651	.40

[1] *Magicicada septemdecim* = S; *M. cassini* = C.

[2] Crude density calculated as cicadas emerging per square meter.

The emergence in the study sites was relatively uniform from May 19 until the 27th when following a cold night no cicadas could be found emerging anywhere on the campus or in the surroundings. Emergence resumed in some areas on the 28th and 29th, but no further emergence was observed after the latter date. About May 27th, nymphal skins were removed from all areas and no further emergence was indicated after the 29th by presence of adults or new nymphal skins through June 6th.

The data in Table 1 are only semi-quantitative since many cicadas probably escaped by climbing directly up trees before the collectors appeared on the scene. However, there are indications that shading, slope, and degree of soil compaction influences the timing of emergence. In all areas the earlier emergence was noted along an open edge or thinly shaded area and in Area 6 the largest emergence from the densely shaded portion came 6 days after fairly heavy emergence had occurred at the open edge. In Area 3 the heaviest emergence occurred along the open south edge and the heavily shaded portion produced only a few cicadas although this was the location of the disruption of the I.U. commencement by a cicada chorus in 1936. In the heavily compacted areas many defective cicadas were found.

These had apparently injured themselves burrowing up through the soil and gravel.

No large choruses were heard on the campus, nor was there much evidence of oviposition. It is possible that the remaining forest fragments are now too small to support viable populations of *Magicicada*. However, large choruses were not apparent in 1953 nor was much oviposition damage evident, yet the emergence in Area 4 was as heavy or heavier than in 1953.

A minor emergence of *Magicicada septendecim* occurred in Area 6 in 1966 (1 male, May 24; 5 nymphal skins, June 2). This may represent a relict of Brood VI which emerged in that year and was recorded from southern Indiana, but may be support for Lloyd and Dybas' hypothesis (2) of a four-year acceleration in duration of the life cycle.

A single female of *M. septendecim* was collected in Bloomington, May 29, 1967. It is improbable that this represented Brood VII which has not been reported from Indiana in recent years.

A single male of *M. septendecula* was collected on the campus in 1968 (May 21) and probably represents an accelerated emergence of Brood X although possibly Brood VIII which emerged in that year in Ohio and Illinois but was not recorded from Indiana.

Observations elsewhere suggest that Brood X has been considerably reduced over much of its range. The writer crossed Kentucky and visited a number of counties in which *Magicicada* was recorded in North Carolina, South Carolina, and Georgia in previous emergences of Brood X. Cicadas were found in Trimble and Henry Counties, Kentucky, and a verbal report was obtained of a very light emergence in Madison County. No evidence of emergence or reports could be obtained in North or South Carolina or Georgia. In Tennessee, emergence was moderately heavy in the eastern part of the state. Emergence was also heavy in Maryland, Pennsylvania, and Washington, D.C. It seems possible, however, that Brood X is now divided into three main areas if indeed it was ever one unit.

Economically, the 1970 emergence of *Magicicada* seems to have been unimportant in Indiana. Forest trees were "flagged" over large areas, but none seems to have been killed by cicada oviposition. Some damage to small trees planted along Interstate 65 in Floyd, Clark, and Jackson Counties was evident. Lombardy poplars seem to have been favorites of the cicadas or showed more evident damage. Damage to small trees in most cases occurred near woodlands, but "flags" were evident on some trees at a considerable distance from forested areas. Orchardists generally seem to have protected their plantings with sprays and fogging. In the areas of heaviest emergence the only trees besides the evergreen which escaped all damage were *Ailanthus*. Oviposition in poison-ivy was observed in several places, and in Morgan-Monroe State Forest a list of trees and shrubs showing oviposition marks included every woody plant that could be identified.

Acknowledgment

I want to acknowledge the technical assistance of Barbara Frey and Brett Pilger who assisted with collecting and preserving the cicadas.

Literature Cited

1. DYBAS, H. S., and M. LLOYD. 1962. Isolation by habitat in two synchronized species of periodical cicadas (Homoptera: Cicadidae: *Magicicada*). Ecology 43:444-459.

2. LLOYD, M., and H. S. DYBAS. 1966. The periodical cicada problem II. Evolution. Evolution 20:466-505.