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The 1999 Emergence of the Periodical Cicadas in Ohio (Homoptera: Cicadidae: *Magicicada* spp. Brood V)

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Abstract. The periodical cicadas belonging to Brood V emerged in 1999 over most of eastern Ohio. The emergence was widespread and heavy in the southeastern portion of the state and in Summit, Medina, and southern Cuyahoga counties. The brood is experiencing a recession along its western boundary, which is as much as 10 miles eastward from its 1914 western boundary. The brood is also declining in parts of Wayne, Holmes, Stark, and Tuscarawas counties.

Introduction

The periodical cicada Brood V emerged over much of eastern Ohio in 1999. This brood was recorded in 1812 by S. P. Hildreth (1826) who described the emergence in Marietta and documented its appearance in that city in 1795. It was carefully mapped by Webster (1897) in 1897, by Gossard (1916) in 1914, by Parks (1948) in 1931, and by Forsythe (1976) in 1965. These maps, when combined with the 1999 emergence, provide a century-long history of this brood in Ohio.

Materials and Methods

The 1999 distribution of the periodical cicada was mapped with the help of hundreds of contributors. A website was established to encourage people to e-mail the first author when the periodical cicada emerged in their areas. They were requested to provide the county, city, and zip code for each emergence site. Phone calls were made to the state parks and wildlife areas in the emergence area to determine if the insects had appeared in those localities. Finally, surveys were conducted to determine the distribution limits of the periodical cicada's emergence. These surveys involved driving through the suspected emergence area and looking for nymphal skins and adults, listening for cicada singing, and/or looking for oviposition damage.

Results

The first author received 430 e-mails detailing information about when and where the cicadas had emerged in eastern Ohio. The e-mails, phone calls, and surveys documented that the periodical cicadas emerged in 42 counties. The counties and localities are listed in Table 1 and the distribution is shown in Figure 1. Following the practice of cicada reports for the past century, the emergence map (Figure 1) was produced with large circles for counties where the emergence was heavy and widespread, and small circles for light, scattered emergences. All three species, *Magicicada septendecim*, *M. cassini*, and *M. septendecula*, emerged.

Discussion

The 1999 emergence of Brood V in Ohio further documented the decline of this brood as first described by Forsythe (1976). The extent of this decline can be seen by comparing the 1999 emergence (Figure 1) with the 1914 emergence (Figure 2). The 1914 map was reconstructed using Gossard's (1916) record of the 1914 Brood V emergence. Large circles represent counties where Gossard recorded at least two "swarms" and at least five additional emergence reports. Small circles represent counties where Gossard had reported scattered emergences and at most only one swarm. The recession in the emergence area is occurring throughout the margins of the brood's historical range. The periodical cicadas are now gone from Erie County, and

they have disappeared from northern Huron County and from most of Seneca County. The scattered emergences from Trumbull, Mahoning, and Columbiana counties which occurred in 1914 were not reported in 1999.

The brood is also disappearing along its western limits. Forsythe (1976) noted this recession in the 1965 emergence. Surveys in western Licking and western Knox counties documented that the periodical cicada has disappeared from these regions. Gossard (1916) had several localities from these counties when they emerged 85 years ago. Even more dramatic is the reduction along the southwestern boundary of the brood. The periodical cicadas did not emerge in Pickaway, western Ross, western Pike, and western Scioto counties. Indeed, the 1999 emergence western boundary was at least 10 miles eastward of the 1914 boundary in Pike, Ross, and Scioto counties.

The brood is also declining in eastern Wayne, western Stark, northeastern Holmes, and western Tuscarawas counties. Gossard's (1916) map from the 1914 emergence shows that periodical cicadas emerged throughout this area. The reasons for this decline are unknown. However, similar declines have been observed in Indiana for Brood X where the brood has disappeared throughout the north-central part of the state (Kritsky, 1988a).

We did receive an e-mail report of approximately 25 individuals in Columbus in Franklin County. This would be the first report of Brood V periodical cicadas in Franklin County in this century and, if true, would suggest that they have not entirely disappeared from the county, but that small isolated numbers are still surviving. The fact that they were noticed was likely due to the intense media coverage in the Columbus area. How long periodical cicadas can survive in extremely low numbers has not been determined, but other studies indicate that they could survive for centuries (Kritsky, 1999). Our survey of the Columbus area did not confirm any emergence in the county. Therefore, Figure 1 does not represent a Franklin County emergence.

The periodical cicada was confirmed in western Ashtabula County. It was reported as occurring there in 1863 and 1880 by Webster (1897), and again by Forsythe (1976) in 1965.

The emergence was heaviest in the southeastern part of the state where there are more woodlands, and in Summit, Medina, and southern Cuyahoga counties in more urban areas. This increase in urban areas is not surprising because periodical cicadas prefer to oviposit in trees in full sunlight surrounded by low vegetation (Lloyd, 1984). This increase in periodical cicadas in cities has been observed in other broods, especially Brood X in Cincinnati (Kritsky, 1988b).

Summary

The periodical cicada Brood V is the most widespread brood in Ohio occurring over the eastern half of the state, but this brood is declining in parts of its range. Surveys of the 1999 emergence documented that the brood's western limits have moved as much as 10 miles eastward since 1914 in some areas. Moreover, the brood is also declining in parts of Wayne, Holmes, Stark, and Tuscarawas counties. These declines are likely due the clearing of woodlands for agricultural activities. The brood is still strong in the southeastern portion of the state. In Summit, Medina, and southern Cuyahoga counties the brood may be increasing, continuing a trend of population expansion in urban areas.

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Table 1. Counties and locations of the 1999 emergence of the periodical cicadas.

County	City	County	City
Ashland	Mifflin Twp.	Guernsey	Cambridge
Ashland	Mohican State Park	Guernsey	Quaker City
Ashtabula	Rock Creek	Guernsey	Salt Fork State Park
Athens	Athens	Guernsey	Senecaville
Athens	Glouster	Harrison	Cadiz
Athens	Lodi Twp.	Harrison	Scioto
Athens	Millfield	Hocking	Haydenville
Athens	Nelsonville	Hocking	Logan
Athens	Southern part of county	Hocking	Rockbridge
Athens	Stewart	Hocking	Tar Hollow State Park
Athens	Strouds Run State Park	Holmes	Millersburg
Belmont	Barkcamp State Park	Holmes	Southwestern part of county
Belmont	Bellaire	Huron	Boughtonville
Belmont	Martins Ferry	Huron	New Haven
Belmont	Powhatan Point	Huron	North Fairfield
Belmont	Shadyside	Jackson	Jackson
Carroll	Dellroy	Jackson	Jackson Lake State Park
Carroll	Kensington	Jefferson	Fairfield
Carroll	Minerva	Jefferson	Mingo Junction
Coshocton	Woodbury Wildlife Area	Jefferson	Richmond
Cuyahoga	Bedford	Jefferson	Steubenville
Cuyahoga	Berea	Jefferson	Toronto
Cuyahoga	Brecksville	Jefferson	Winterville
Cuyahoga	Brecksville Res.	Knox	Bladensburg
Cuyahoga	Garfield Heights	Knox	Gambier
Cuyahoga	North Royalton	Lake	Colburn Rd
Cuyahoga	Olmstead Falls	Lake	Concord Twp.
Cuyahoga	Parma	Lake	Holden Arboretum
Cuyahoga	Peninsula	Lake	Kirtland Hills
Cuyahoga	Solon	Lake	Perry
Cuyahoga	Strongsville	Lawrence	Decatur Twp.
Cuyahoga	Strongsville Wildlife Refuge	Licking	Fallsburg
Fairfield	Lancaster	Licking	Granville
Fairfield	Wahkeena Nature Preserve	Licking	Jacksontown
Franklin	Columbus?	Lorain	Columbia Twp.
Gallia	Cheshire	Lorain	Findlay State Park
Gallia	Gallipolis	Lorain	Grafton
Gallia	Huntington Twp.	Lorain	Lagrange
Geauga	Chardon	Lorain	Wellington

Table 1. Counties and locations of the 1999 emergence of the periodical cicadas, continued.

County	City
Medina	Chatham Twp.
Medina	Hinckley
Medina	Mallet Creek
Medina	Medina
Medina	Medina Twp.
Medina	Spencer
Medina	Valley City
Medina	Westfield Center
Meigs	Columbia Twp.
Meigs	Darwin
Meigs	Pomeroy
Monroe	Woodsfield
Morgan	Chesterhill
Morgan	Glouster
Morgan	Pennsville
Morgan	Stockport
Morrow	Mount Giliad State Park
Morrow	Northeast county
Muskinghum	Blue Rock State Park
Muskinghum	Dresden
Muskinghum	Nashport
Muskinghum	New Concord
Muskinghum	Norton
Muskinghum	Roseville
Muskinghum	Zanesville
Noble	Buffalo Twp.
Noble	The Plains
Noble	Wolf Run State Park
Perry	Crooksville
Perry	Hopewell Twp.
Perry	New Lexington
Perry	Somerset
Pike	Jackson Lake
Pike	Waverly
Portage	Aurora
Portage	Edinburg
Richland	Butler
Richland	Malabar Farm State Park
Richland	Mansfield
Richland	Mifflin Twp.
Ross	Adelphi
Ross	Chillicothe
Ross	Massieville
Ross	Scioto Trail State Park
Scioto	Clarktown
Scioto	Lucasville
Scioto	Minford
Scioto	Sciotoville
Seneca	Attica
Seneca	Bloomville
Seneca	Frank
Seneca	Scipio Siding
Seneca	West Lodi
Stark	Canton
Summit	Akron
Summit	Bath Twp.
Summit	Cuyahoga
Summit	Hudson
Summit	Macedonia
Summit	Northfield
Summit	Northfield Center
Summit	Richfield
Summit	Stow
Summit	Stow
Summit	Twinsburg
Summit	West Branch State Park
Tuscarawas	Midvale
Vinton	Allensville
Vinton	Knox Twp.
Vinton	Lake Hope
Vinton	Tar Hollow State Forest
Vinton	Zaleski State Forest
Washington	Belpre
Washington	Marietta
Washington	Vincent
Wayne	Shreve Lake Wildlife Area
Wayne	West Salem

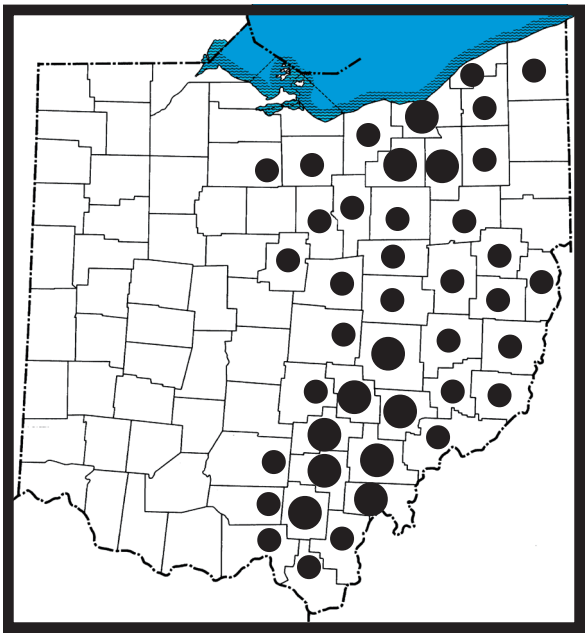

Figure 1. The 1999 distribution of the periodical cicada in Ohio. Large circles represent heavy emergences and small circles represent light and scattered emergences.

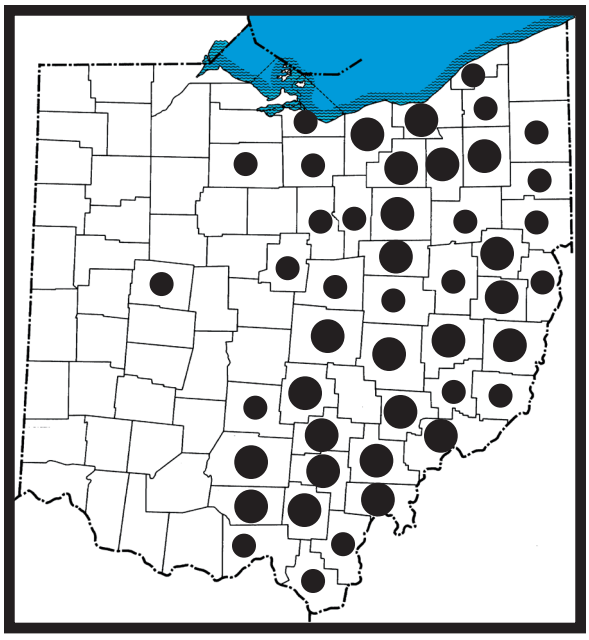

Figure 2. The 1914 emergence of Brood V in Ohio (drawn after Gossard, 1914). Large circles represent counties where at least two swarms and five scattered emergences were found. Small circles represent counties where only scattered emergences and at most only one swarm was recorded.