

PERIODICAL
CICADAS
("THE 13-YEAR
LOCUSTS")
IN ALABAMA



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JAMES E. MARION, DIRECTOR
AUBURN UNIVERSITY, ALABAMA

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Information contained herein is available to all persons without regard to race, color, sex, or national origin.

PERIODICAL CICADAS¹
("THE 13-YEAR LOCUSTS"²)
IN ALABAMA

L.L. HYPHE²

Once every 13 years, precisely on schedule, there occurs in widely scattered areas of Alabama woodlands a remarkable historic and spectacular entomological event. Peaceful wooded areas are transformed literally overnight into amazing scenes of noisy insect activity. Lower portions of tree trunks, and stems, twigs, and leaves of understory plants are littered with tan to brown empty insect skins (Photo 1). The woods are suddenly populated with numerous large, black-bodied, red-eyed insects (Photo 2) and the air is filled from morning to dusk with loud, incessant song. The event is the mass emergence of adults of Brood XIX of 13-year periodical cicadas, or locusts as they are more commonly known in Alabama. The most recent of these events in Alabama occurred in the spring of 1985; the next will occur in the spring of 1998. Based on records of the past and results of studies at the Alabama Agricultural Experiment Station, emergence should take place sometime during the last 10 days of April and the first week of May.

¹*Magicicada* spp., Order Homoptera; Family Cicadidae.

² Associate Professor, Department of Entomology

History of the Periodicals

Periodical cicadas are native inhabitants of the eastern United States. Colonists in New England encountered them in the early 1600's and duly recorded and described the event.

".....there was a numerous company of Flies, which were like for bigness unto Wasps or Bumble-Bees, they came out of little holes in the ground, and did eat up the green things, and made such a constant yelling noise as made all the woods ring of them, and ready to deaf the hearers;....."

".....there was such a swarm of a certain sort of insects in that English colony, that for the space of 200 miles they poyson'd and destroyed all the trees of that country. There being found innumerable little holes in the ground, out of which those insects broke forth in the form of maggots, which turned into flyes that had a kind of taile or sting, which they struck into the tree, and thereby envenomed and killed it.."

The preceding quotations are excerpts from the earliest published accounts³ of periodical cicadas. Reference in each is to the emergence in 1634 of a population of 17-year periodicals. The brood to which the population belonged still exists and is currently recognized as Brood XIV. These interesting accounts describe the event in sufficient detail to make it possible, with today's knowledge of these insects, to recognize the "numerous company of flies" as cicadas. While descriptive, the accounts were not accurate in all details. For example, the "Flies" do not actually "eat up the green things, nor, with "a kind of taile or sting" are trees "thereby envenomed and killed."

Early colonists had no prior knowledge of periodical cicadas, their habits, or the consequences of their presence. They were, however, familiar with the legends of locust plagues of the Old World. The sudden emergence of millions of noisy unknown "flyes" from "innumerable little holes in the ground" apparently appeared to be a similar plague, thus the origin of the name "locusts"⁴ commonly applied to cicadas.

³The first quotation is from Marlatt, 1906, Circ. No. 74 (see References). According to Marlatt, the account was originally reported in "New England's Memoriall" by Nathaniel Moreton in 1669. The second account is from Simon, 1988 (see References). Simon lists the source as: Oldenburg, H. 1666. *Philos. Trans. London* 1:137.

⁴By entomological classification, the name "locust" properly belongs to a group of grasshoppers (Order Orthoptera). Nevertheless, the term, originally supplied by early settlers, is still commonly applied to cicadas today.

Periodicals are divided into two groups, 17- and 13- year cicadas. These are based on the lengths of developmental periods which terminate, in spectacular fashion, with the sudden appearance of adults after an absence of 13 or 17 years. For over 200 years following discovery by colonists in New England, only the 17-year group was known. The presence of 13-year cicadas was not discovered until the mid-1800's. The 17-year cicadas are mostly northern, and the 13- year primarily southern; however ranges of the two groups overlap. That 13 or 17 years are required to complete the life cycle does not mean that adults are present only at 13- or 17-year intervals. Several broods exist within each group. The length of the life cycle for each is appropriately consistent. However, time periods of development and year of adult emergence vary among broods.

Individual periodical cicada broods are identified by number. In 1893, a standardized system utilizing Roman numerals was adopted. The 17-year broods were assigned numbers I-XVII; the 13-year broods, XVIII-XXX. Thus, the 17-year and 13-year cicadas emerging in 1893 were designated Brood I and Brood XVIII, respectively. Thereafter, numbering continued in sequence by year. Theoretically, there could be 30 broods of periodicals, but not all that have been numbered actually exist. The existence of some has never been validated, and some have become extinct. Today, 15 broods are generally recognized; three 13-year broods (XIX, XXII, and XXIII), and 12 17-year broods (I-X, XIII, and XIV).

Originally and for many years only one species, *Magicicada septendecim*, was officially recognized. In the mid-1900's workers⁵ reported the existence of three distinct species of 17-year cicadas, *M. septendecim*, *M. cassini*, and *M. septendecula*. These three forms occur also in the 13-year group. There appears to be no consistent morphological difference between 17- and 13-year specimens of the same species. However, species of the 13-year cicadas have been designated *tredecim*, *tredecassini*, and *tredecula*, corresponding to 17-year *septendecim*, *cassini*, and *septendecula*.

⁵Alexander and Moore (see References).

Description

Periodical cicada adults (Photo 2) are spectacular in appearance and, to the casual observer, the three species look basically alike. The body is mostly black on top. The head is broad, and the abdomen tapers to the rear. Eyes are conspicuously red; legs and wing veins are reddish orange; wings are nearly transparent with an orange tint. However, color of the ventral surface of the abdominal segments varies by species (Photo 3): solid reddish brown or yellowish in *M. septendecim/tredecim*; black in *M. cassini/tredecassini*; and, segments black basally with a transverse reddish-yellow apical band in *M. septendecula/tredecula*. Adults are 1 1/4 to about 1 3/4 inches long. Size varies, however, by species: *M. septendecim/tredecim*, largest; *M. septendecula/tredecula*, smallest; and *M. cassini/tredecassini*, intermediate.

Sex of cicada adults is easily determined. Females possess blade-like ovipositors visible on the ventral surface of the abdomen (Photo 4). Males possess a pair of sound-producing, or “singing”, organs located laterally on the ventral surface of the first abdominal segment (Photo 5). Each organ consists of a large plate-like structure, the operculum, which covers a cavity containing a white or yellowish membrane and an oval, ribbed, drum-like structure called a timbal. Timbals are vibrated by strong muscles to produce the cicada song.

Periodical Broods Occurring in Alabama

Periodical cicada populations in Alabama are primarily 13-year Brood XIX. This is a southeastern brood that ranges west into Louisiana and north into Illinois and southern Iowa. In Alabama, the brood is widely distributed throughout much of the northern three-fourths of the state (see map). Ranges of three other extant broods, one 13-year and two 17-year, extend into states bordering Alabama. Brood XXIII (13-year) occurs throughout Mississippi and western Tennessee. A population believed to be of this brood was recorded in some past years at Tuscaloosa in Tuscaloosa County. Thus, small isolated populations of the brood may possibly occur in some western areas of the state. Years of last and next emergence of adults for Brood XXIII are 1989 and 2002. Ranges of eastern Broods X and XIV (17-year) extend into areas of eastern Tennessee and northern Georgia adjacent to Alabama. Some past reports have indicated the possible presence of one or both of these broods in Northeast Alabama. However, in more recent distributional maps ranges of these do not extend into the state. The last and next emergence dates for these are: Brood



Photo 1-Typical cast skins of newly emerged periodical cicada nymphs.



Photo 2- Periodical cicada adult, *Magicicada* spp.

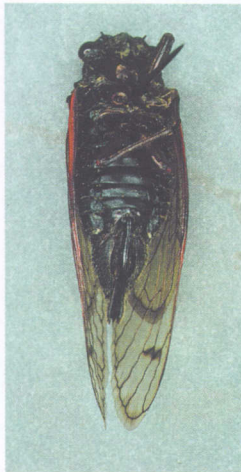


Photo 3-Ventral view of the abdomen of the three 13-year cicadas: Left to right; tredecim, tredecassini, tredecula.

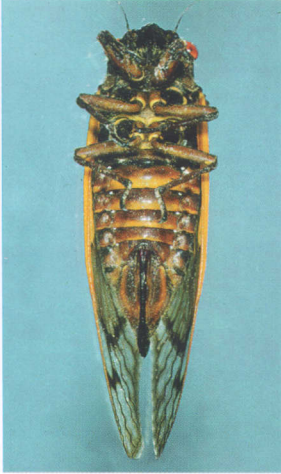


Photo 4-Ventral view of the female periodical cicada. Note the ovipositor at the rear of the abdomen.

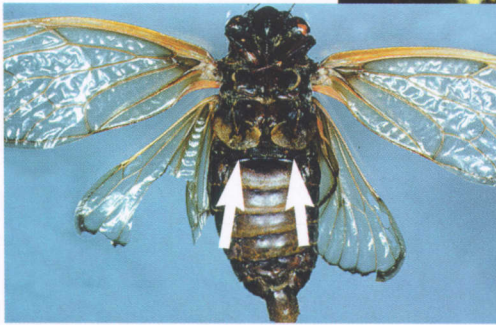
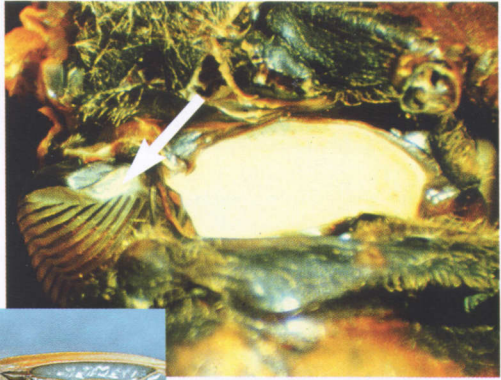
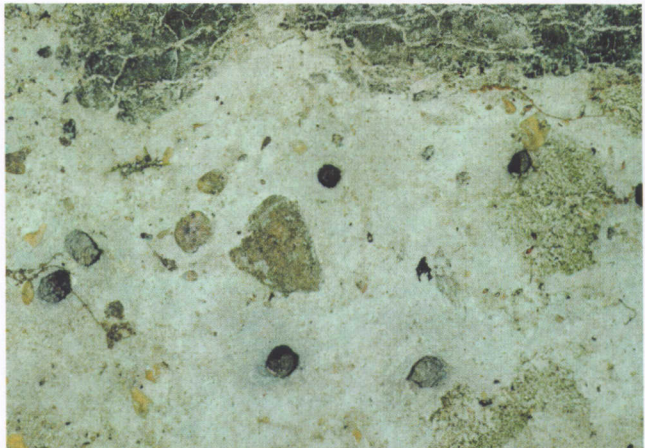


Photo 5-Singing structures of the male cicada. Left - Flap-like opercula on the ventral surface of the first abdominal segment; above - Operculum removed to expose the white membrane and sound-producing timbal.

Photo 6- Exit holes left by nymphs emerging from the soil.



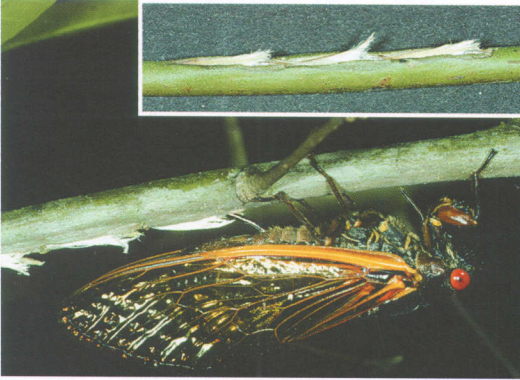


Photo 7- Female cicada ovipositing in hardwood twig. Inset - closeup of oviposition slits.



Photo 8- Grooves in which eggs are deposited.



Photo 9- Typical rows of cicada eggs. Inset - close-up of a newly laid egg.

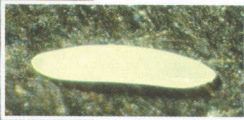


Photo 10- Dead male cicadas collected from the ground beneath trees about two weeks after emergence.



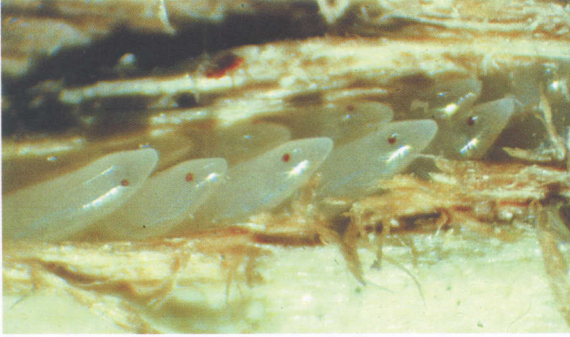


Photo 11-Eggs with fully developed embryos - note the eyespots.



Photo 12-Newly hatched periodical cicada nymph.



Photo 13-Typical damage to young trees caused by ovipositing females: (left) dead upper main stem of oak; (right) broken limb of sweetgum. Note the numerous oviposition slits along the stem and branch.



Photo 15-Dog-day cicada nymph (above) and typical cast skin (below).

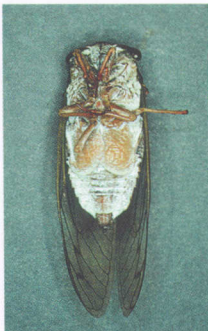


Photo 14-Typical adults of dog-day cicadas; dorsal (left) and ventral (right) views.

As noted, cicada nymphs develop for 13 years in the soil. In spring, fully grown nymphs emerge at night leaving numerous exit holes (Photo 6). Nymphs climb onto trees and other plants or objects nearby, shed the last nymphal skin (see Photo 1), and transform to winged adults. Adults possess sucking-type beaks but feed little, if at all, and cause no discernible damage to plants by feeding. In 1985, nymphal development at Goat Rock was complete in late April. According to local residents, newly emerged adults were seen and heard singing beginning about April 29 - May 1. Inspection of the area on May 9 revealed an abundance of cast skins and numerous adults on foliage and twigs of trees and understory plants. No mating or oviposition was noted on May 9, but singing was loud and continuous. Cicada song is produced only by males, and is involved in attraction of females. Singing begins in early morning and subsides in the evening. Each species produces its own characteristic song. "Trained ears" familiar with cicada songs can identify each species by its song.

Mating was first observed on May 10; oviposition began shortly thereafter and was occurring actively by May 13. Females lay eggs in small twigs and stems of a wide variety of broadleaf trees and shrubs. Common trees utilized in the Goat Rock area were oaks, hickories, dogwood, black cherry, blackgum, sweetgum, mulberry, and elm. Diameter of most twigs and stems utilized was 1/4 to 1/2 inch. In the process of oviposition, the female cuts slits in twigs with her ovipositor (Photo 7). Inside each slit she constructs two grooves (Photo 8) and deposits a row of eggs in each (Photo 9). Eggs are white, spindle shaped, and approximately 2 mm long (a little less than 1/10 inch). In 225 egg grooves examined, the number of eggs per groove varied from 4 to 19, but most grooves contained 12 to 16; the mean number per groove was 13.7. The mean number of eggs per oviposition site, grooves combined, was about 27.

By May 16, adult activity had begun to decline: mating and egg-laying activity was noticeably reduced; some dead adults, primarily males, were present beneath trees (Photo 10); singing, however, was still clearly audible and constant. By May 20, singing was noticeably diminished, and ovipositing females were scarce. By May 28, singing was faint and intermittent, and adults were seldom seen. By June 3, all adult activity had ceased, and dead and dying twigs and stems of young hardwood trees and shrubs were common (See Damage Section).

Following cessation of adult activity, twigs containing eggs were collected and eggs were examined periodically for development. By June 18, embryos within eggs had developed to the point that eyespots were visible (Photo 11); by the end of June, about 6 1/2 weeks after onset of oviposition, eggs began to hatch and nymphs (Photo 12) began to emerge from twigs. Nymphs dropped to the soil and entered to begin the 13-year phase of nymphal development.

Happenings as they occurred during the study of the cicada population at Goat Rock represent the typical developmental cycle of periodical cicadas (Brood XIX) in Alabama. Date of emergence of nymphs and appearance of adults may vary a little by year and location within the state, but should occur during the period late April-early May. Adults sing, mate, and lay eggs over a period of about four weeks, usually through most of May, then die. After the 1998 event, adults of Brood XIX will not appear again until spring of 2011. Emergence of Brood XXIII is due in eastern Mississippi and western Tennessee in 2002. It is possible that some adults of this brood may appear in some areas of northwestern Alabama during May of that year.

Damage

Damage to twigs and stems of trees and shrubs is caused by ovipositing females. In the egg-laying process, females puncture bark and wood of stems in construction of pockets for eggs. Extensive ovipositional activity severely injures twigs and stems and they break or die (Photo 13). On large full-canopied trees, damage to twigs is unsightly, but does not seriously injure the tree. However, among small young trees, damage, especially to main stems, may result in loss of growth, misshapened trees, or even tree mortality. If damage occurs in orchards, such as apple, peach, or pecan, crop yields may be reduced.

Nymphs feed on root systems. In natural mixed woodlands, damage is of no consequence. In production orchards, however, vitality of trees may be reduced.

Other Cicadas

There are two general groups of cicadas in Alabama, the aforementioned periodicals and the common "annuals." Habits and mode of

development are much the same for the two groups, except for the duration of development cycles. The “annuals” consist of several species commonly referred to as harvest flies, July flies, or dog-day cicadas. Two to five years, depending on the species, are required to complete the life cycle. However, broods overlap, consequently adults are present every year.

The species of annual cicadas with which most are familiar belong to the genus *Tibicen*. These are large cicadas; adults (Photo 14) of some species are about 2 inches long. Typically, the body is black with areas of green above and sometimes dusted with white beneath. Eyes are black and legs greenish. Wings are clear, but are sometimes tinged at the bases with green.

Nymphs (Photo 15), like those of periodicals, develop in the soil. They emerge in mid-summer, shed the familiar skin (Photo 15), and become adults. Adults are active in July and August (dog days). *Tibicen* males, like those of *Magicicada*, possess sound-producing organs and are responsible for the familiar song commonly heard during the long hot days of late summer.

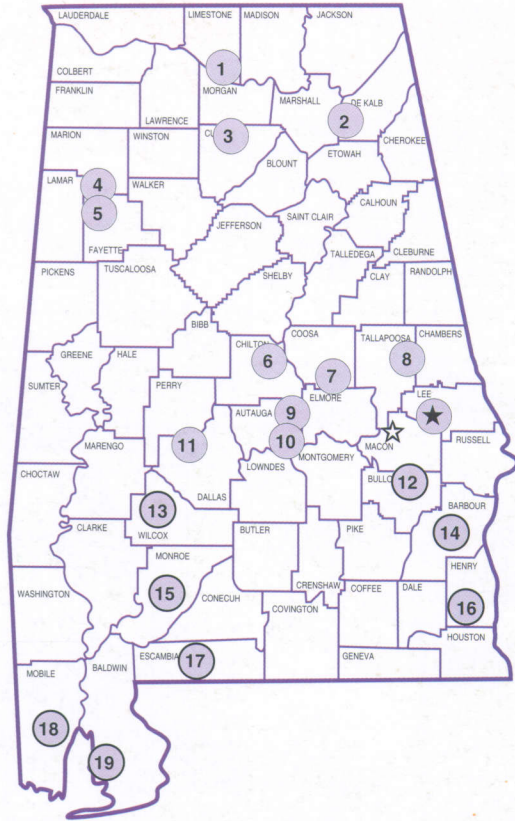
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Alabama's Agricultural Experiment Station System

AUBURN UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the state has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



Research Unit Identification

- ★ Main Agricultural Experiment Station, Auburn.
- ☆ E. V. Smith Research Center, Shorter.

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| <ul style="list-style-type: none"> 1. Tennessee Valley Substation, Belle Mina. 2. Sand Mountain Substation, Crossville. 3. North Alabama Horticulture Substation, Cullman. 4. Upper Coastal Plain Substation, Winfield. 5. Forestry Unit, Fayette County. 6. Chilton Area Horticulture Substation, Clanton. 7. Forestry Unit, Coosa County. 8. Piedmont Substation, Camp Hill. 9. Forestry Unit, Autauga County. 10. Prattville Experiment Field, Prattville. | <ul style="list-style-type: none"> 11. Black Belt Substation, Marion Junction. 12. The Turnipseed-Ikenberry Place, Union Springs. 13. Lower Coastal Plain Substation, Camden. 14. Forestry Unit, Barbour County. 15. Monroeville Experiment Field, Monroeville. 16. Wiregrass Substation, Headland. 17. Brewton Experiment Field, Brewton. 18. Ornamental Horticulture Substation, Spring Hill. 19. Gulf Coast Substation, Fairhope. |
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