

Observations on the Two Forms of the Periodical Cicada

Magicicada septendecim (L.)

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Introduction

Magicicada septendecim (L.) occurs, at least in Indiana, in two markedly different forms, one large and the other small. In the small form, both sexes measure about 25 millimeters to the tip of the abdomen, and the males 32 and the female 36 millimeters to the tip of the folded wings. In the large form, both sexes measure about 29 millimeters to the tip of the abdomen, and the males 39 and the females 42 millimeters to the tip of the folded wings. According to Deay (1953) the small form was described as a new species, *M. cassinii* by Fisher in 1851, but was considered only a variety of *M. septendecim* by Riley (1885).

During the emergence of brood X in 1953, the writer made some studies of the habits of the two "races" near Bloomington, Monroe County, Indiana where both forms occurred in profusion.

Emergence

The first individual to be observed emerging, May 7, was a large form, followed by other large forms during the next three days. Since only fifteen individuals were observed emerging between May 7 and May 11, small forms could easily have been emerging in similar numbers unnoticed. Small forms were observed to emerge on May 11, after which time both forms were observed to emerge in numbers. The holes left in the ground following emergence were often rather permanent and were inhabited by numerous insects, including wasps.

The cast skins of the two races were distinct in size, those of the small race measuring only about 23 millimeters to the tip of the abdomen, while those of the large race measured 27 millimeters. (The skins vary considerably in size due probably to shrinkage and torsion, but the two forms were, overall, quite distinct.)

Sex Ratio

Counts of cast skins of the small forms showed females to exceed males by 3800 to 1600, or 2.4:1. Counts of those of the large forms similarly showed females to exceed males 4600 to 3000, or 1.5:1.

Behavior of the Adults

The first individual to be heard singing (May 15) was a large form, to be followed by other large forms in increasing numbers. The first small form was not heard singing until May 20. After May 25, both forms were heard in large numbers.

The songs of the two forms were clearly distinct, that of the large forms being a low trill similar to the trill of the American toad, *Bufo americanus*, while that of the small forms was a high pitched tone resembling the song of the harvest fly, *Tibicen linnei*, and closely resembling the sound of a large electric motor. Although the large forms sang in a steady trill, the songs of the small forms modulated in frequency, since the males sing in unison at temperatures approaching or exceeding 30° C. The males singing in unison were gathered into assemblages in single trees or in groups of trees throughout the countryside. Each assemblage had its individual rise and fall of modulation, but the overall frequency of modulations was remarkably constant, eleven per second, at temperatures exceeding 30° C. One assemblage, in a shaded grove of slippery elms, was found to maintain a frequency of only ten per second from day to day while other assemblages, in sunny situations, were modulating at eleven per second. The modulation rose in frequency as the temperature rose in the day, the lowest frequency being seven per second heard when the temperature was rising from 27 to 28° C. within a period of five minutes.

The large forms began singing earlier in the day and at lower temperatures than the small forms. The small forms were usually almost silent on days when the temperature was not rapidly rising above 28° C., but the large forms were often very vociferous at this time.

By July 7, the small form was heard only as individuals, although the air temperature rose to 29° C. on this date. The large forms were, however, still uniformly noisy on July 7. On July 8, the maximum air temperature was again 29° C., and the first *Tibicen linnei* was heard: *M. septendecim* behaved much as on July 7. On July 9-12, the maximum temperature was only 25° C., and no cicadas were heard. *M. septendecim* was last heard on July 8.

Studies on Host Preference of the Size Forms

It was noted that the two forms, although overlapping on many trees, seemed in general to be isolated. In noting the trees inhabited by the two forms, it was found that the large forms were present almost to the exclusion of the small forms in shaded groves of the beech, *Fagus grandifolia*. On the other hand, the small forms preponderated on most of the other trees, and on many trees they were present to the exclusion of the large forms. The small forms seemed to show a marked preference for the green ash, *Fraxinus lanceolata*. Other trees on which the small forms were found in the great majority were: white ash, *Fraxinus americana*; slippery elm, *Ulmus fulva*; american elm, *Ulmus americana*; *Crataegus* sp.; apple, *Pyrus Malus*; pear, *Pyrus communis*; wild cherry, *Prunus serotina*; sycamore, *Platanus occidentalis*; honey locust, *Gleditsia tricanthos*; and walnut, *Juglans nigra*. The two forms were present in about equal numbers on beeches in the open, and one or the other form would preponderate where beeches were mixed with other trees. Collections of cast skins showed skins of the large form to preponderate under beeches, and those of the small form to preponderate under the other trees. Collections of skins in shaded beech groves showed almost all large

forms to be present, and similar collections in elm groves showed almost all small forms to be present.

On trees where the two forms were found together, examination of numerous pairs failed to disclose evidence of intermating between the two forms.

Literature Cited

- DEAY, H. O. 1953. The periodical cicada *Magicicada septendecim* (L.) in Indiana. Proc. Ind. Acad. Sci., **62** :203-206.
- RILEY, C. V. 1885. The periodical cicada. U. S. D. A., Div. Ent. Bull., **8** (old series) : 46 pp.