FURTHER STUDIES OF THE BIOECOLOGY OF THE NEW ENGLAND TINGIDAE (HETEROPTERA)[1]

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Part III. Seasonal Population Trends of the Walnut Lace Bug, *Corythuca juglandis* (Fitch)

The area in which this study was made is described generally in Part I of this series, where the methods employed are also detailed (Bailey, 1963). There are two butternut trees (*Juglans cinerea* L.) near the Hyatt Avenue boundary of the College land. The smaller of the two is only about 20′ north of the roadside while the other is about 75′ from the street and approximately 60′ NW of the first butternut, which will be referred to as *Juglans* A. There is a grassy field between them.

Juglans A is only about 20′ tall with a low, spreading top. At its branch tips on the east is a tall white lilac (*Syringa vulgaris* L. var. *alba* West.) with a neglected pear tree (*Pyrus communis* L.) just beyond. By the roadside there is a red cedar (*Juniperus virginiana* L.) with a mulberry (*Morus alba* L.) growing beside it. These two trees are nearly as tall as *Juglans* A. Except for these four specimens, *Juglans* A stands in the open surrounded by a field except to the east where a tangle of shrubs and rank herbs prevails. The three main stems of *Juglans* A have the heartwood exposed on the west from the ground to a height of about ten feet. I have been told that this was the result of fire injury that occurred a few years before we moved here. In the eight years the tree has been under my observation (since the fall of 1956), the bark has grown in some from the sides of the wound but the exposed wood is now badly decayed. The somewhat stunted habit of *Juglans* A probably is due in part to this severe injury and to the heavy annual infestation by *Corythuca juglandis* (Fitch). Except on the west side, the lower branches are easily reached, making collecting convenient.

The second butternut, *Juglans B,* is tall and apparently vigorous. By estimate, its height is about 35′ and it dominates spreading ash-

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leaved maples (*Acer negundo* L.) growing under and around it to the south and east. Northwest is an old apple tree (*Pyrus malus* L.). Because of these surrounding trees, there are few branches of *Juglans* B accessible from the ground.

In the fall of 1956 large numbers of *Corythuca juglandis* (Fitch) were observed on *Juglans* A. This suggested the field work that was initiated the following spring and expanded to a study of local Tingid populations. During the 1957 season collections were taken from Juglans A at near weekly intervals from late May until early October. In 1958 and 1960, with assistance from the grants mentioned, regular weekly collections were made from both butternuts throughout the periods of lace bug activity.

For reasons not yet clear the infestation has been consistently heavier on *Juglans* A. Two conditions may have some bearing on this. As already noted, *Juglans* A has several leafy branches near the ground and there is a heavy sod of timothy (*Phleum pratense* L.) orchard grass (*Dactylis glomerata* L.) and other herbs beneath this tree. The clumps of grass culms and other low vegetation possibly provide a favorable shelter for overwintering lace bug adults. Just under *Juglans* B the ground is nearly bare because of heavier shade from the surrounding trees, and only on the east are a few branches within reach from the ground. Curiously, these two trees, with only a grassy field between them and the minor differences cited, support very different population concentrations of this lace bug as the graphs clearly show (Figures I-IV).

In 1957 seventeen collections were made and a total of 266 specimens taken. Of these 176 were females and 90 were males for a sex ratio of almost 2:1. Unlike the three season record for *C. mollicula,* however, (Bailey, 1963) totals for *C. juglandis* for the same three seasons are 1696 ♀♀ and 1505 ♂♂ — or a ratio of roughly 5:4 in favor of the females. With more collecting this would perhaps approximate even more closely a 1:1 relationship. Since the population trends for 1957 are otherwise similar to the subsequent studies, and because the interval between collections was not as regular that year,

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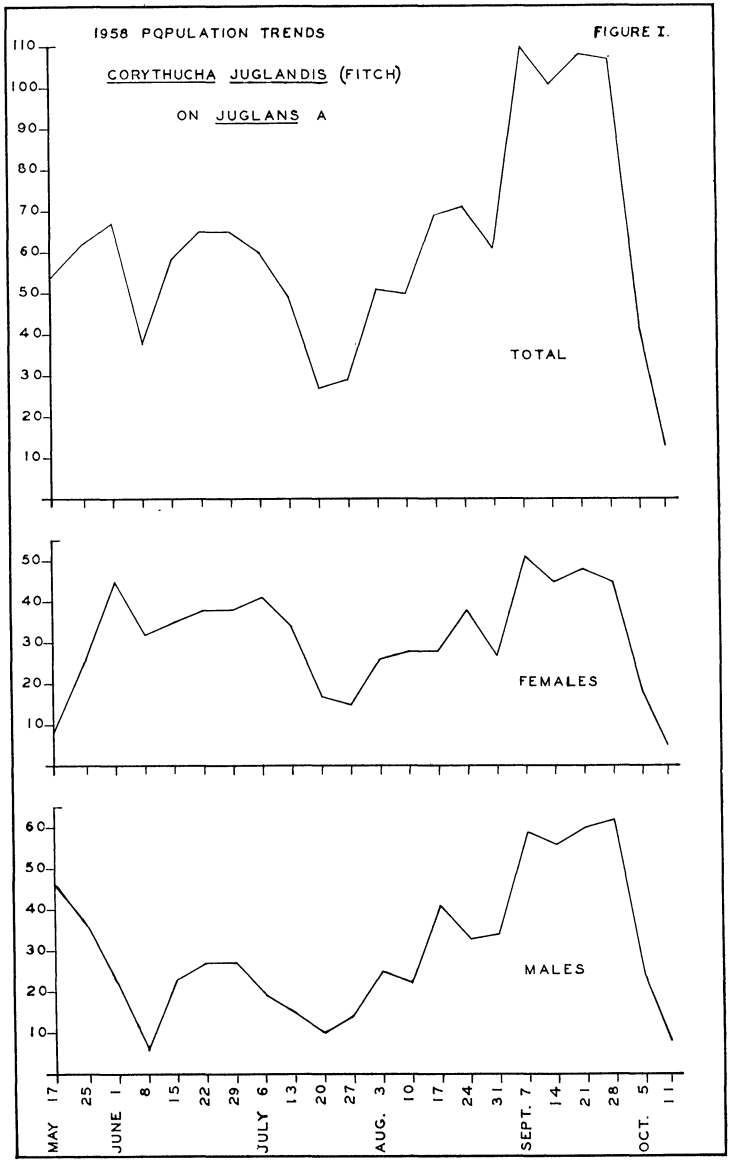
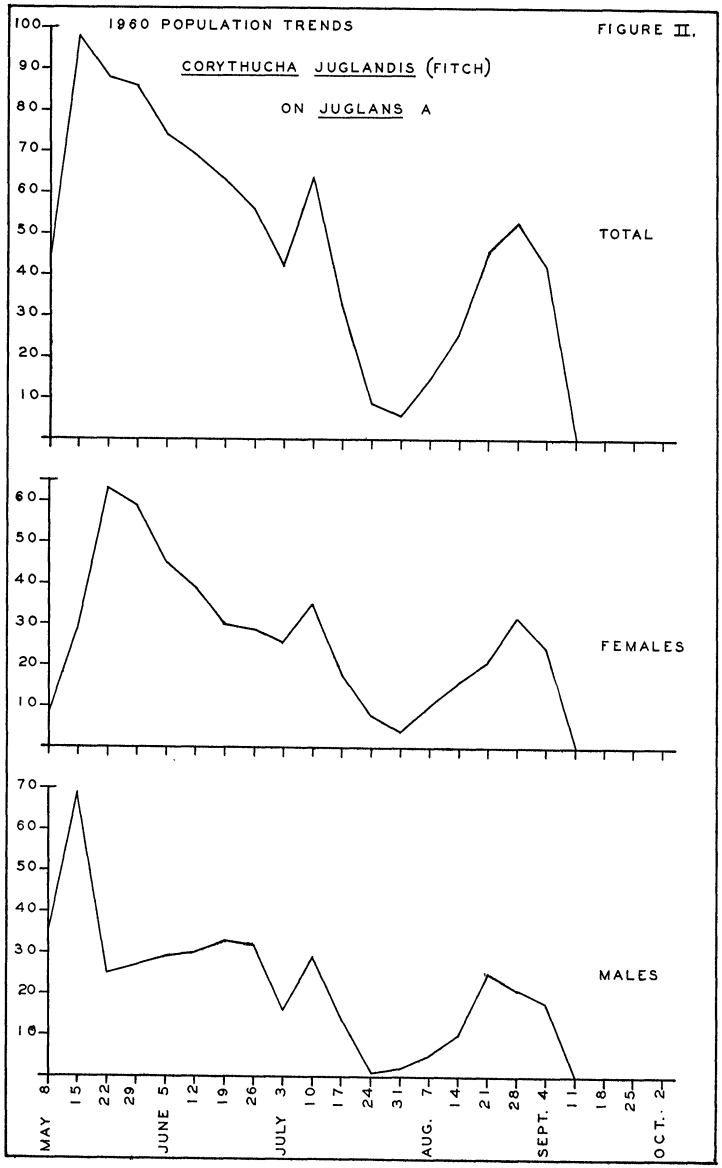
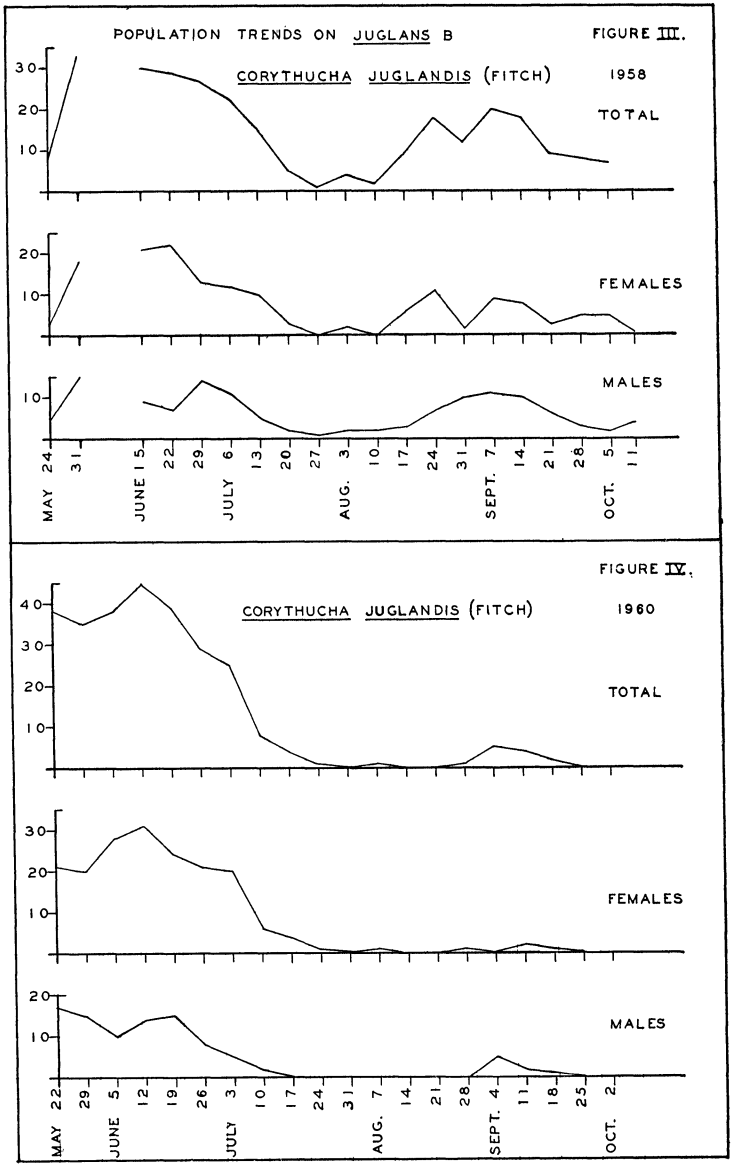
Explanation of Figures I, II, III and IV.

These figures present graphically the population trends for *Corythuca juglandis* (Fitch) on two specimens of *Juglans cinerea* L. for the two years specified. The curves are based on actual numbers (indicated on the left) of adult lace bugs collected on the dates given at the bottom of each figure. In each figure the uppermost curve represents the totals of all population samples for the season. Differences in the seasonal distribution of females and of males in these same collections are shown by the middle and the lowermost graphs respectively.


1958 POPULATION TRENDS
FIGURE I.
CORYTHUCHA JUGLANDIS (FITCH)
ON JUGLANS A
TOTAL
FEMALES
MALES
110
100
90
80
70
60
50
40
30
20
10
MAY 17
25
JUNE 1
8
15
22
29
JULY 6
13
20
27
AUG. 3
10
17
24
31
SEPT. 7
14
21
28
OCT. 5
11


1960 POPULATION TRENDS
FIGURE II.
CORYTHUCHA JUGLANDIS (FITCH)
ON JUGLANS A
TOTAL
FEMALES
MALES
MAY
JUNE
JULY
AUG.
SEPT.
OCT.


POPULATION TRENDS ON JUGLANS B
FIGURE III.
CORYTHUCHA JUGLANDIS (FITCH)
1958
TOTAL
FEMALES
MALES
30
20
10
MAY 24 31 JUNE 15 22 29 JULY 6 13 20 27 AUG. 3 10 17 24 31 SEPT. 7 14 21 28 OCT. 5 11
FIGURE IV.
CORYTHUCHA JUGLANDIS (FITCH)
1960
TOTAL
FEMALES
MALES
40
30
20
10
MAY 22 29 JUNE 5 12 19 26 JULY 3 10 17 24 31 AUG. 7 14 21 28 SEPT. 4 11 18 25 OCT. 2

only the collections from *Juglans* A and B in 1958 and 1960 are recorded graphically. In Part I of this series (Bailey, 1963) Figures I and II show the weekly rainfall and the weekly temperature averages for these two seasons.

Depending on climatic conditions this species is active from early May (May 8, 1960) into early October (October 11, 1958). On one occasion they were so abundant on *Juglans* A that 110 were collected in five minutes (September 7, 1958).

In 1957 a single leaf yielded 48 (31 ♀♀ and 17 ♂♂). Since the leaves of *Juglans* are large and pinnately compound, this is actually not a large number. At times, I am sure, the number on such a leaf would far exceed this. Usually these leaves consist of 15 leaflets (7-17 according to Fernald, 1950). These leaflets are oblong-lanceolate with acuminate tips and broadly rounded bases. The veins are prominent on the lower surface and both surfaces are covered with a velvety pubescence. An individual leaflet may be more than 12 cm. long and nearly 6 cm. wide. The entire compound leaf is often about 24 cm. wide by over 50 cm. long. The Tingids generally feed on the lower surface but may be seen infrequently on the upper side of the leaflet in heavy infestations.

Experimental marking of this species gave some promising results. On August 5, 1958, 100 specimens were marked with a yellow plastic paint by placing a dot on a hemielytron with a fine brush tip (or dry grass stem) while the insects were on the leaves of *Juglans* A. For several days thereafter marked specimens were seen on the host plant until as late as August 31st. Again on September 3rd more than 525 lace bugs on *Juglans* A were marked in the same manner with white paint to distinguish them from the earlier lot. Many of these were observed still feeding on the host on September 7th, and as late as September 21st marked specimens were easily located on the foliage. Although little collecting was done in 1959, a single marked specimen that had overwintered was recovered early in the season. At least under some conditions this plastic paint will adhere well and it is apparently non-toxic as used. Also, it is available in many colors and is sold inexpensively in small bottles. Further experimental use is indicated by the results of these preliminary efforts.

Figures I and II reveal an interesting contrast in the seasonal population trends of *Corythuca juglandis* (Fitch) on *Juglans* A in 1958 and 1960. In 1958 it was mid-May before leaf development and temperatures favored mass emergence of the hibernating lace bugs. Although temperature fluctuations were marked throughout the season,

the lace bugs were active into early October. In 1960, however, emergence was about a week earlier and temperature changes were less marked, especially after early July. Although collections were attempted through October 2nd, no specimens were taken on *Juglans* A after September 11th. That fall the fringe of a hurricane brought strong winds and 4½ inches of rain in a storm that started on the 11th and lasted until the following evening. The night of the 17th there was a light frost. Most of the large butternut leaves were stripped off or badly tattered. The severe storm followed so soon by a frosty night sent most *C. juglandis* into hibernation nearly a month earlier than in 1958.

Lace bug numbers on *Juglans* B have been consistently small as Figures III and IV indicate. Somehow the collection for June 8, 1958 was misplaced or passed over when the data were being tabulated. This explains the break in the Figure III graphs. The storm and frost that drove the insects from *Juglans* A after September 11, 1960 did not as completely eliminate them from *Juglans* B which is somewhat more protected by the surrounding trees. On the basis of the few differences noted, it is difficult to understand why the populations on these two host plants should vary so much.

This species emerges from hibernation by early or mid-May, depending on host leaf development. By late June or early July the first brood is maturing and a second appears by mid-August or early September. In favorable seasons they may remain active into early October, but such a combination of weather conditions as occurred in early September 1960 may send most of them into hibernation a month earlier. Two annual broods are apparently usual in northeastern Massachusetts. In 1958 the second brood produced the greatest population concentration (see Figure I) while in 1960 the greatest population peak was produced by the emergence of overwintering adults (see Figure II).

It is also evident (Figures I and II) that males of this species are somewhat more numerous than the females at the beginning of the season. This was also true in 1957.

Literature Cited

N. B. The names of cultivated and native plants mentioned in this paper are those used by L. H. Bailey and M. L. Fernald respectively.

The distribution and biology of *Corythuca juglandis* (Fitch) is fully reviewed and detailed references are given in my 1951 paper on the Tingoidea of New England.

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