The Great Lakes Entomologist

Volume 4
Number 1 -- Spring 1971 *Number 1 -- Spring 1971*

Article 6

July 2017

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ANNUAL VARIATION IN STARTING DATE OF SPRING FEEDING BY THE EUROPEAN PINE SHOOT MOTH IN A MICHIGAN PLANTING

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ABSTRACT

New tents spun in five successive springs by the European pine shoot moth (*Rhyacionia buoliana* [Schiff.]) in a Michigan planting of red pine (*Pinus resinosa* Ait.) occurred about 2 days later each year. This trend is believed due to habitat cooling as trees grow larger. In another planting feeding was more advanced on small trees than on large trees.

INTRODUCTION

Feeding in buds and elongating shoots, the European pine shoot moth (*Rhyacionia buoliana* (Schiff.)) disrupts the growth of young pines. It can be suppressed with contact poisons in the spring or summer at earliest signs of feeding. After wintering in or near injured buds, partly grown larvae turn to fresh buds in April. Before boring in, each larva spins a silken, tentlike anteroom. Tents are soon coated with resin and other debris. This makes them conspicuous and useful for accurately timing suppression treatments (Miller 1967). Pointing (1963) has described early spring larval activity in detail.

A study was done to learn more about how starting date of spring feeding varies from year to year. Few starting dates have been reported. In northeastern Ohio, three observations ranged from April 13 to 20 (Miller and Neiswander 1955). These were based on casual checks in a different pine planting each year. In southern Michigan, more rigorous studies yielded two starting dates: April 14 (Graham and Williams 1958) and April 17 (Haynes and Butcher 1962). Apparently, starting dates have not been reported for more than one year in the same planting.

A 5-year record of incipient tent spinning was made in a red pine (*Pinus resinosa* Ait.) planting near East Lansing, Michigan. Later, an observation in a different red pine planting tested whether starting date varied with tree size. In brief, results show that incipient spring feeding occurred later each year. It also appeared earlier on small trees than on larger ones.

FIVE-YEAR RECORD

Early each spring, from 75 to 100 injured tips were tagged so they could be easily spotted for regular checking. These tips were located in all crown parts of 30 to 40 trees; half were tagged below midcrown and half above. The trees were part of a 1-acre planting growing on a 3 per cent, west-facing slope. They were 3.5 feet tall the first year. The site was good and the trees grew about 1 foot taller every year despite shoot moth attack. Tagged tips were checked every 2 or 3 days. When a new tent was found, the date was noted and the tag removed. A tip was not checked again once a tent appeared on it.

New tents were spun about 2 days later each year (Fig. 1). Because larvae spin more than one tent in the spring and second tents begin to appear about the 10th day of feeding (Haynes and Butcher, 1962), the trend lines were cut off before the tenth day.

Initial spinning dates of the shoot moth over a 5-year period could occur in 120 different sequences (5!). The orderly trend of starting dates seems too unique among so many possibilities to be a chance occurrence. It is reasonable to look for another explanation. A cooling trend seemed likely and there were two possible sources: local climate and planting microclimate.

Official weather records from the East Lansing-Lansing area for 1958-62 were examined. March and April averages of mean, minimum, and maximum daily temperatures followed similar patterns. These patterns did not show a consistent downtrend, but there was a decline between all pairs of years except the third and fourth. Average daily means for March and April were 42.6, 40.0, 35.4, 39.4, and 38.6° F.

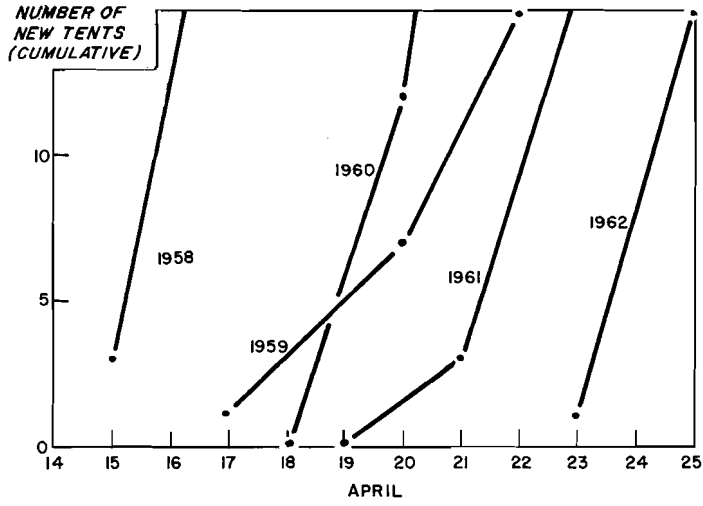

Fig. 1. Onset of spring feeding as gaged by new tents in a red pine planting near East Lansing, Michigan, 1958-62.

As for microclimate, Haynes and Butcher (1962) found that daily high April temperatures averaged 6 degrees more on the ground under red pine trees than in crowns 7 feet up. This helped to explain why their larvae near the ground began activity earlier than cohorts higher on the same trees. Pointing (1963) also found that 10 larvae within 2 feet of the ground started spring feeding an average of 5 days sooner than 49 larvae higher up. He inferred that ". . . spring feeding will start . . . somewhat earlier on small trees than on larger trees. . .". Thus, both macro- and microclimate could have contributed to a cooling trend. To further explore the role of tree size, the following direct test was undertaken.

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DOI: 10.22543/0090-0222.1136

DIRECT TEST OF TREE SIZE

The onset of early spring feeding was to be compared on small and large trees growing side by side. Another red pine planting near East Lansing, Michigan, was used in which there were uneven-aged blocks of half an acre or more. The younger trees were about 2.5 feet tall and the older ones about 8 feet tall—similar to the starting and ending tree heights in the planting used to get the 5-year record. The part of the planting used was growing on a 5 per cent, north-facing slope. Equal numbers of injured tips were tagged in two rows of small trees and in two neighbor rows of large trees. Again, half the tags were placed above midcrown and half below. The tagged tips were checked for new tents every 2 or 3 days. Checking was ended 7 days after the first notice of activity. New tents appeared on 12 tips of the large trees and 32 tips of the small trees during those 7 days (Fig. 2). Larval activity on the small trees was about 2 days ahead of that on the large trees. This confirmed Pointing's expectation and helped to show why spring feeding should have started later each year: the trees were becoming larger.

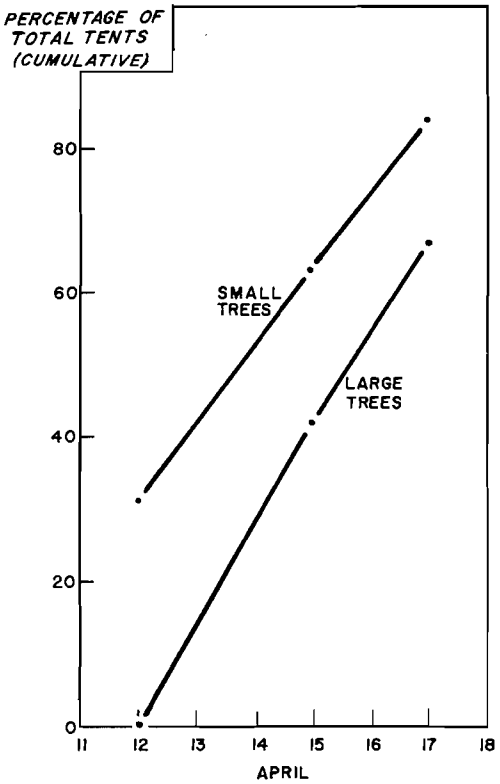

Fig. 2. Onset of spring feeding on small and large trees in a red pine planting near East Lansing, Michigan, 1963.

To conclude, starting dates of spring feeding by the European pine shoot moth were not erratic. They varied only about 2 days between one year and the next. The fact that starting dates tended to occur later each year over the 5-year period is most likely due to cooling of the larval habitat associated with increasing tree size, perhaps also to a cooling trend in local climate. The study planting doubled in height over the 5 years and lower branches began to

interlock. Tips thus increased in average distance from the ground. As the ground under the planting became more shaded, it probably absorbed less solar energy (Reifsnyder and Lull 1965). With tips becoming more remote from the ground and ground heat reserves declining, the larval habitat would have grown cooler each year.

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BOOK REVIEW

CENTURIE DE LÉPIDOPTÈRES DE L'ILE DE CUBA (1832). Felipe Poey y Aloy. Hampton, Middlesex, England: E. W. Classey, 1970. xii, 4, [54] pp. $30.00. Entomological Reprint Specialists, Los Angeles, California.

Felipe Poey (1799-1891) was born in Havana. After receiving his higher education in Europe, he practiced law at the French court, and was a founding member of the Societe Entomologique de France in 1832. In April of that year he began publication of the *Centurie,* which, as the full title imples, was to contain descriptions and figures of one hundred species of Cuban Lepidoptera. The work was to be issued in fascicles of ten species each, but only two of these "decades" ever appeared, and the *Centurie* was abandoned after publication of the second fascicle in July. Poey had, however, described eighteen new species. In August he returned to Cuba, having given up the practice of law. His decision was a lucky one for Cuban natural history, for he eventually became director of the Zoological Museum of Havana, and wrote on topics ranging from ichthyology to geology.

The *Centurie* is now a scarce and costly book, lacking even in some of the larger university collections of entomological literature. The very attractive Classey reprint will fill some of these lacunae, although its relatively high price will place it beyond the means of many private individuals. Unfortunately this is the result when a small press run and colored plates combine to cause high production cost, and a publisher with limited resources can hardly be blamed for the situation.

There is an introduction by the well-known entomological bibliographer C. F. Cowan, including a brief sketch of Poey's life and sections on the dating and arrangement of the *Centurie.* Poey's four-page advance prospectus of the work is included, and the twenty colored plates are faithful copies of Poey's originals, if not always of the original specimens; for, as Cowan reminds us, white and red paints used in the hand coloring of plates have often blackened with age. In the case of *Arctia jussiaeae* (appearing in most surviving copies of the original to be a black moth, although it was originally painted in white), this has been corrected, but in minor cases the publisher has quite understandably chosen not to emend the colors.

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