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**FIRST RECORDS OF THE WHITE PINE SHOOT BORER,
EUCOSMA GLORIOLA (LEPIDOPTERA: OLETHREUTIDAE)
IN MICHIGAN**

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During late June and early July, 1965, it was apparent that plantations of Scotch and Austrian pines in various Michigan counties were being damaged by lepidopterous larvae mining in the pith of newly developed lateral and terminal branches. Infested samples were examined by Dr. William Wallner, Department of Entomology, Michigan State University, and an attempt was made to rear the extracted larvae. Although as many as two larvae were present in some of the shoots, none survived and no adult moths were secured. A series of larvae was preserved for future study.

In the fall and winter of 1965-66, I determined through correspondence with forest entomologists that the damage was similar to that inflicted in other states by the white pine shoot borer, *Eucosma gloriola*, a species described by Heinrich (1931) and discussed by Drooz (1960). Affected lateral shoots had drooped, faded, and turned a brownish color as the season progressed. More-



Fig. 1, Adult males of *E. gloriola*, collected in a Scotch pine plantation, Ottawa Co., Mich., 20 May 1966. Photo by P. H. Wooley. Fig. 2, Tunnel of larva in lateral twig of Scotch pine. Photo by author.

over, the larvae, which ranged from 15 to 18 mm. in length, agreed with Heinrich's description (Figs. 1-3).

On 6 May 1966, several of the infested plantations in Muskegon and Ottawa counties were searched for live pupae in the soil. The pupae of *gloriola* are well camouflaged by adhering soil particles, and none were located, but I soon collected four small coppery-red moths by beating the trunks of Scotch pine. These specimens were immediately identified as *gloriola* from Heinrich's description, and further examples were captured that day by the same method. In all, five males and one female were taken in Grand Haven Township, Ottawa County, T7N, R16W, Section 13.

When disturbed, the moth usually flew directly into the lateral branches of a nearby tree and quickly ran toward the base of a shoot to conceal itself in the needle mass. In this position, it would harmonize in color with the tawny orange needle sheath. Occasionally a moth dropped directly to the ground and remained motionless in the surface debris. In either case the well-camouflaged insect could be easily captured if located, as it would make no further attempt to escape.

Constant evidence of depredations from previous seasons was observed; blackened and dried laterals, and occasionally a terminal, bore mute testimony to the damage *gloriola* can inflict upon Christmas tree plantations. More than 95 per cent of the apparent damage was to the lateral branches, but infested terminals usually break off and drop while laterals remain attached to the tree.



Fig. 3. Pale, drooping lateral branches of Scotch pine, indicating presence of *E. gloriola* larva. Ottawa Co., Mich., 12 July 1966. Photo by author.

On 13 and 17 May I visited the Ottawa County plantation again and found the moths more abundant; nine males and four females were collected. By May 20 the sex ratio, which had been predominantly male, was more equal. Twenty specimens were taken; eleven were males and nine were females. The sex ratio being nearly equal indicated close to peak emergence for the season of 1966. Undoubtedly, emergence data will not be constant from year to year because of the impact of widely fluctuating May temperatures in Michigan. During the 1966 season adult flight persisted throughout May; oviposition was noted on 13 May, and was observed as late as the first week in June. The weather had become unseasonably cold and wet during May, thus undoubtedly retarding emergence of the main population.

Serious larval mining began in June and by the end of the month paling and drooping laterals were observed. These indications of infestation became more apparent in early July. The larvae fed until late July, then chewed their way outside, dropped to the ground and pupated in the soil or debris. A discussion of the moth's life history with descriptions of larval damage may be found in Drooz (1960) and need not be repeated here.

A search of the literature has shown that these Ottawa County specimens are the first to be reported from Michigan, although records are extant from Ontario, Quebec, Connecticut, Maine, Massachusetts, New Jersey, New York, Pennsylvania and Wisconsin (Drooz, 1960). Undoubtedly additional Michigan specimens of *gloriola* will be found in collections; as example, I have recently been informed by Dr. William E. Miller, Principal Insect Ecologist, North Central Forest Experiment Station, St. Paul, Minnesota, that he has identified a single female specimen of *gloriola* in material taken by Robert R. Dreisbach in Crawford County, Michigan on 28 April 1957. A genitalic slide prepared by R. B. Moore confirmed this identification (personal communication, 16 November 1966). Three male moths of this species were taken in Missaukee County, Michigan on 23 May 1966 by Mr. Paul Flink and his field staff from the Forestry Division, Michigan Department of Agriculture. On 13 July, 75 fourth instar larvae were collected from jack pine laterals in the same general area.

Recent correspondence with Mr. Flink has revealed that jack pine damage indicating *gloriola* infestation has been observed in eight counties of Michigan's Upper Peninsula: Gogebic, Iron, Dickinson, Marquette, Delta, Schoolcraft, Luce, and Chippewa. Similar damage has been reported from five Lower Peninsula counties other than Muskegon, Ottawa and Missaukee: Grand Traverse, Wexford, Kalkaska, Otsego and Crawford (personal communication, 27 October 1966). The species probably occurs throughout Michigan wherever its hosts are found; these have been variously reported as Scotch pine, jack pine, mugho pine, pitch pine, white spruce and Douglas fir, red pine, and Austrian pine (Drooz, 1960, Heinrich, 1931, and Mackay, 1959).

Commercial Christmas tree plantations should be searched for signs of this species, and large jack pine tracts should also be examined, as they could serve as reservoirs of infestation. Because of the larval feeding habits of this species a residual chemical material is indicated for control. The emerging larvae must ingest a lethal dose of the control material before entering the shoots where they are protected from further control applications. Some larvae leave the original entry hole and select another, thus providing an opportunity for additional control from a residual type material.

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A FLIGHT OF EPHEMEROPTERA IN
EIGHTEENTH-CENTURY FRANCE



One of the more attractive features of Réaumur's classic *Mémoires pour servir à l'histoire des insectes* (Paris, 1734-42) is the use of a pictorial vignette as a headpiece to the first 'mémoire' in each volume. The sixth volume (1742) features an illustration of timely interest for the month of June.

Six ladies and gentlemen are seen viewing a mass emergence of Ephemeroptera by torchlight. The caption to Haussard's engraving explains that "le sujet de la Vignette . . . représente un bras de rivière qui coule le long d'un escalier sur lequel se sont rendues des personnes de l'un & de l'autre sexe, pour voir tomber pendant une nuit obscure, à la lueur de plusieurs flambeaux, une pluie d'éphémères. Les marches, & la partie de la rivière qui en est proche, sont couvertes de ces mouches. L'air en est aussi rempli qu'il l'est certains jours d'hiver de gros flocons de neige."

Réaumur's image of the great snowflakes is a especially apt one, as anyone who has watched the emergence of mayflies will agree.

R.S.W.