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ABSTRACT: The lodgepole needle miner in the Inyo National Forest begins its 2-year-cycle in even-numbered years. In contrast, *Coleotechnites milleri* (Busck) in Yosemite National Park begins its in the odd-numbered years.

RETRIEVAL TERMS: *Coleotechnites* near *milleri*; *Pinus contorta* var. *murrayana*; Inyo National Forest; Sentinel Meadow; defoliation damage; needle miners; generation establishment; Sierra Nevada eastside.

OXFORD: 416.12--145.718.07 *Coleotechnites* near *milleri*:147.7 *Pinus contorta* (794).

Needle Miner Infestations in
Lodgepole Pine East of the Sierra Crest

George R. Struble

Stands of lodgepole pine (*Pinus contorta* var. *murrayana*) at or above 8,000 feet elevation in the Inyo National Forest, Mono County, California, are periodically infested by a needle miner. These infestations east of the Sierra Nevada crest have been known since 1939, with evidence of previous damage to host trees dating much earlier. The attacking insect is a gelechiid moth closely related to *Coleotechnites milleri* (Busck), a major defoliator in the high-elevation lodgepole pine of the Tuolumne-Merced watershed in Yosemite National Park.

Differences in life cycle and in larval mining habits have suggested that the Inyo infestations are not the same as those in Yosemite. But taxonomic studies by Hodges¹ of specimens in each population have shown that they are similar.

I first observed these eastside infestations in 1957 on about 200 acres near Sentinel Meadow (T. 2 S., R. 29 E.). By 1966, the infestations had spread across 2,000 acres. Defoliation in the heaviest centers of attack had weakened many trees, and some of them were killed by the mountain pine beetle (*Dendroctonus ponderosae* [Hopk.]). But after 10 years of attack, damage was much less than that in Yosemite, where about 20 percent of the stands infested by *C. milleri* later died.

Studies were made of the Sentinel Meadow infestation during five generations beginning in 1957. Maximum infestations were determined from larvae established in 40 twig tips clipped from 10 random trees in the heaviest infestation centers. Biological development was determined from periodic observations and from rearings of adults,



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as a generation approached maturity. Populations established within the heavy infestation center (table 1) did not change drastically in the five generations.

The life cycle and the time requirements of the various stages of the needle miner are similar to that of *C. milleri*.² The number and color variation of larval stages are the same. The Inyo species requires 2 years to complete its cycle, with each generation establishment period in even-numbered years (fig. 1). There are no overlapping generations. *C. milleri* is established in odd-numbered years. This out-of-phase development cycle appears to be the only major difference between the two needle miner populations.

The maturing larva mines less before pupation than does *C. milleri*. In Sentinel Meadows, most of the needles are mined two-thirds or less the total length from the apex toward the base. In Yosemite, complete mining of needles is done by maturing larvae of *C. milleri*.

FOOTNOTES

¹R. W. Hodges, U.S. Nat. Mus., Agricultural Research Service, U.S. Dep. Agr.

²Struble, George R. *Lodgepole needle miner*. U.S. Dep. Agr., Forest Serv., Forest Pest Leaflet 22, 7 pp., illus. 1958.

Table 1.--Needle miner populations established¹ in Sentinel Meadow infestations, Inyo National Forest, California (Basis: four tips/tree/10 trees)

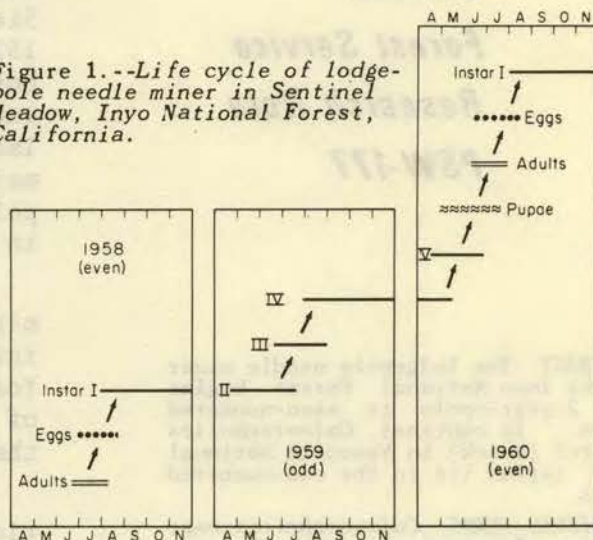
Year	Tips	Needle miners		
		Per tip	Standard error	Range
	No.	Number		
1956	2/10	3/29.90	+ --	10-81
1958	40	40.50	+ 4.08	0-35
1960	40	26.40	+ .72	0-42
1962	38	24.96	+ 2.22	0-36
1964	30	28.80	+ 2.94	0-56

¹Instar-I and -II larvae in needles.

²Observational count of 10 miscellaneous tips.

³Total in latest five internodes.

Figure 1.--Life cycle of lodgepole needle miner in Sentinel Meadow, Inyo National Forest, California.



The Author

GEORGE R. STRUBLE, a native of Penryn, Calif., is an entomology graduate of Stanford University (1927). He joined the U.S. Department of Agriculture after receiving a master's degree in forest entomology from the University of California, Berkeley, in 1930. Since 1953 he has been with the Forest Service Experiment Station in Berkeley, where he is studying the biology and ecology of destructive forest insects.