OBSERVATIONS ON *RECURVARIA MILLERI*, THE LODGEPOLE NEEDLEMINER (GELECHIIDÆ)

by G. ALLAN SAMUELSON

The Lodgepole Pine Needleminer, *Recurvaria milleri* Busck, has again developed a major outbreak in Yosemite National Park in the Sierra Nevada of California. Outbreaks of this small Gelechiid have occured every decade or so in Yosemite during recent times and this present epidemic seems to rank along with the largest infestations thus far known, including the major epidemic in 1919.

This infestation is centered in the Tuolumne and Conness basins in the eastern part of Yosemite National Park. The region, for the most part, lies in the Canadian and Hudsonian Life-zones, with elevations ranging from 7,000 to 9,500 feet. The general elevations of the most concentrated infestations occur between 8,000 and 9,000 feet. However, the attacks continue to higher elevations, becoming less evident with the increase of altitude up to nearly 10,000 feet, just below the timberline in this area. Minor attacks have been noted down to 7,000 feet.

The areas of Tuolumne Meadows and Conness Creek within the above mentioned basins and the Tenaya Lake area on the western border of the Tuolumne basin are the most severely attacked. Smaller infestations of less importance are scattered throughout these basins in a region approximating 125 square miles. The Lodgepole Pine, *Pinus contorta murrayana,* the host for *R. milleri,* is the dominant species throughout the entire region. In the Tenaya Lake area, Mountain Hemlock has replaced many of the once dominant Lodgepole Pine due to the 1919 epidemic. Nevertheless, the remaining Lodgepoles in this area have been heavily attacked. In the Conness Creek and the Tuolumne Meadows areas, the forests are practically pure Lodgepole. These areas were attacked extremely hard, especially in the Conness Creek area, which involved almost 100% attack. The areas under serious epidemic conditions (85% infestation) of the entire region, entail well over 45,000 acres.

R. milleri shows no preference to the age of the host tree. In moderately infested areas, where there is a wide selection of the host tree, *R. milleri* is just as likely to attack a young tree as mature or overmature trees. The attacked trees seem to be equally infested from top to bottom.

The reason these infestations are serious is that the host tree is left in a weakened condition and becomes highly vulnerable to fatal barkbeetle attack (Scolytidæ). *R. milleri* alone had never been known to kill its host tree, until we found four succumbed Lodgepoles in the Conness Creek area, deaths caused entirely by this needleminer. Another interesting factor in the Conness Creek area was that the barkbeetles had already started their usual post-needleminer outbreak in August. Ordinarily, these barkbeetles attack the season following the needleminer adult emergence. By the end of August 1953, 70% of the entire Lodgepole population in the immediate Conness Creek area was dead.

The life cycle of *R. milleri* takes two years to complete, and the adults fly only in alternate years. In Yosemite and other regions in California, the adults fly in odd-numbered years while further north this species flies in even-numbered years. Adult emergence extends from the first of July to the last of August. The peak of emergence is usually in the last part of July. The eggs are deposited on and under the needle sheaths at the base of the needles and within the abandoned mines, with the average number of five or six eggs. The incubation period lasts, on the average, for two weeks. The larvæ during the course of their 24 month life cycle actually mine three separate needles before pupation occurs. I will go into a little detail on the larval life cycle, as several interesting observations were noted there. The young larvæ attack the tender, current year's needle growth upon hatching, with one individual per needle. By the end of October of the first season, the larvæ have the needle partially mined, and then they go into a state of torpor during the winter. Mining is resumed in May of the following spring, and the larvæ have the first needle completely mined by August. The larvæ now make their first migration to a fresh needle of the current year's growth and have that needle, again, partially mined before they cease feeding for the second winter period. The larvæ resume activity the following May, and they completely finish the second needle by the first of June. The larvæ now migrate in search of a needle of the same year's growth. The third and last needle is rapidly mined, and the larvæ are fully mature by the end of June. Pupation occurs within the third needle, and adult emergence follows about four weeks later.

In 1953, however, owing to the late season in this area, the development of *R. milleri* was retarded about three weeks. The second larval migration did not begin until the second week in July. At this stage, we noted several interesting observations. In the heavily infested areas the supply of green needles was quickly diminishing. Even the oldest needle growths were soon taken over by the migrating larvæ. During the third week in July there were no fresh needles left in the heavily infested areas, and yet many larvæ were still migrating, with, no doubt, a huge percentage of larval mortality reached in these areas. In one area, however, the migrating larvæ attacked a White Pine. It is not unusual for this needleminer to infest other species such as White Pine; nevertheless, *R. milleri* seemed to be quite devoted to its principal host, as other White Pine stands in heavily infested areas were left untouched. After this migration, I found about six needles which contained two larvæ instead of the usual single larva in each needle. All the larvæ appeared to be quite healthy. This is, apparently, very unusual, as these six needles were the only examples noted after close examination of over four thousand needles. This last observation is somewhat a puzzle: why would a very minute percentage of the nearly mature larvæ choose to share a needle and at least appear healthy, while millions of other larvæ chose to starve to death rather than share quarters? The first adults did not appear until the last week in July, and the flight did not reach its peak until after the second week in August.

Immature stages were collected from every major infestation for studying and rearing. We later found that a fair number of Chalcid wasps emerged from the rearing material. The percentage of Chalcids in this case, however, did not affect the total adult emergence to controllable standards. Perhaps under ordinary conditions these wasps, ecologically, keep a substantial check on *R. milleri.*

Reference

Patterson, J. E., 1921. Life History of *Recurvaria milleri,* the Lodgepole Pine Needle-Miner, in the Yosemite National Park, California. *Journ. Agric. Res.* 21: 129-133.

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THE IDENTITY OF *CRAMBIDIA ALLEGHENIENSIS* (LITHOSIIDÆ)

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Half a century ago HOLLAND (*Moth Book*: 104, pl. 13, fig. 31; 1903) described *Crambidia allegheniensis* from a single male taken by him (*cf. loc. cit.)* in East Pittsburgh, Pennsylvania. The single type, a male, has remained unique in the Carnegie Museum collection, and the species has been listed with a query in lists ever since. A reexamination of this specimen is clearly overdue.

The type is in very good condition save for the complete absence of antennæ (replaced by two clumsily glued, non-lepidopterous, bristles: possibly to make the specimen more photogenic for its portrait in the *Moth Book).* It bears two labels: (1) Moth Book/Plate XIII/Fig.31 [letterpress, with numbers penned in]; and (2) C. allegheniensis/Type.Holland/Ally Co., Penna. [penned in HOLLAND'S hand, possibly many years after publication of the name]. In addition the specimen has been assigned C. M. Ent. type series no. 232, and a label to that effect also affixed.

A brief description of pertinent structures is as follows: palpi short, not reaching front (indeed, not reaching the base of the proboscis); proboscis fully developed; antennæ (broken off); legs smoothly scaled, hind tibia with two pairs of spurs; forewing: R_1 from cell, anastomosing almost immediately with Sc and remaining with it; areole present, R_2 from its anterior border; R_3-R_4-R_5 stalked from its apex, R_5 branching off almost immediately; M_1 from areole just beyond cell; M_2 absent; M_3 and Cu_1 well stalked from lower angle of cell; Cu_2 from middle of cell; hindwing: Sc + R_1 from middle or