Pine Needle-sheath Miner

Robert E. Stevens [1]

The pine needle-sheath miner (*Zelleria haimbachi* Busck) attacks and defoliates several of the two- and three-needled pines. It is a native moth distributed over much of North America (fig. 1). It is not a rare species, but individuals are small; they and their work are relatively inconspicuous unless the population is large. Probably because the needle-sheath miner is unconspicuous and has been of limited economic importance, it is not particularly well known.

Severe infestations have been recorded only from British Columbia and California. In California, damage of varying intensity was noted as early as 1930 at the Institute of Forest Genetics, near Placerville. Severe defoliation threatened part of the Institute's plantations in 1957, and a successful control operation was undertaken.

On the Sugar Hill Plantation, in the Warner Mountains of northeastern California, an infestation has been under surveillance since 1952. Applied control was considered that year, but the insects pupated before action could be taken. In 1953, the population had dropped well below alarming size, but by 1960 heavy defoliation was noted again.

No outright tree killing has been observed, but nearly total defoliation has taken place some years both at Sugar Hill and at the Institute of Forest Genetics. Growth reduction would be strongly suspected where severe defoliation has taken place, but so far no observations on it have been made. Severe defoliation by itself can be serious in arboreta, ornamental plantings, and Christmas-tree plantations.

Hosts

Four species of pine are the most common hosts of the pine needle-sheath miner. Jack pine is the main host in the Great Lakes region, and ponderosa, Jeffery, and lodgehold pines are the principal hosts in the West. Observations at the Institute of Forest Genetics have indicated that nearly all the hard pines, and many of their interspecific hybrids, will support needle-sheath miner populations.

Generally speaking, the needle-sheath miner is a pest of young trees. At Placerville in 1959, when the population was particularly high, trees up to 60 feet tall were heavily infested. Trees less than 4 years old were not attacked, and this is probably about the minimum age at which damage will occur.

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Forest Service **Revised August 1971**

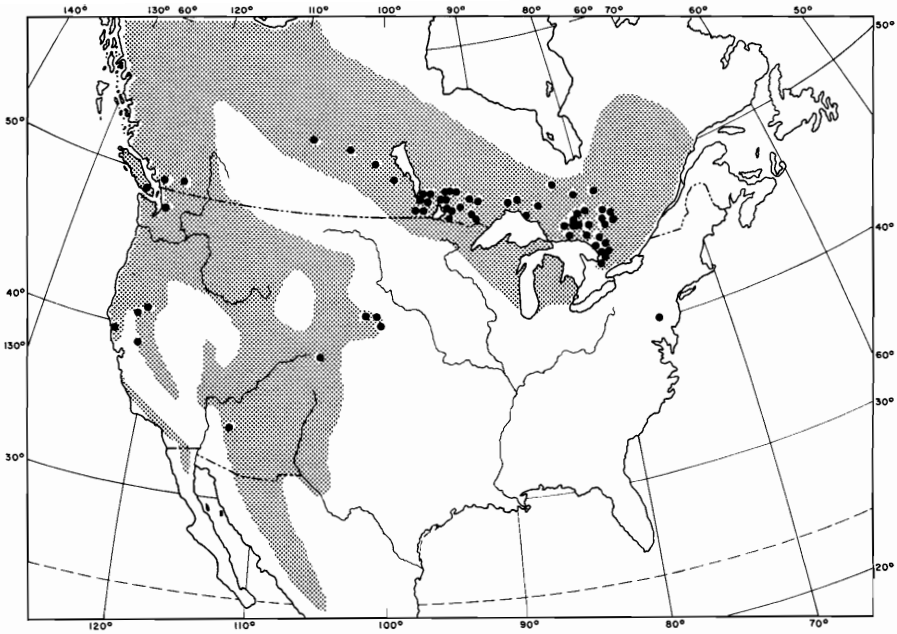

Figure 1.—Pine needle-sheath miner collection points (dots) and generalized range of its principal hosts.

Evidence of Infestation

When populations are heavy, needle-sheath miner infestations are easily detected. The first sign is usually a fading of some of the developing needles of the new growth. On closer examination, a small amount of fine silken webbing can be seen around the needle bases, and the larvae are found within this webbing. As feeding continues, the webbing becomes increasingly dense, in some cases completely obscuring the needle sheaths themselves.

Needles are attacked throughout their period of elongation. The shorter ones merely cease growing and begin to fade, but the longer ones are cut off within the needle sheath and tend to droop back sharply at the sheath. Eventually, these fed-on needles are blown away by the wind. The resultant thinned-out tip remains through the rest of the year and is evidence of the needle-sheath miner's activity. If the population has been light, however, the thinning out may be hardly noticeable.

During a large part of the year, when the larvae are true needle miners, they are particularly difficult to detect. The only evidence is a threadlike mine along the needle edge; it is barely visible to the naked eye.

Life Stages

The adult moth (fig. 2, *D*) has a wingspread of about 12 mm. Its body is silvery white, edged with yellow. The forewings are light golden yellow, with a broad white band down the center. The hindwings, like the body, are silvery white.

The eggs are oblong, whitish, somewhat transparent and are slightly flattened on top. They measure about 0.3 mm. by 0.6 mm.

Newly hatched larvae are thread-like in appearance, about 1.5 mm. long and only 0.10 mm. wide. The head capsule is shiny black, and the remainder of the larva is bright orange and somewhat mottled. In later instars, the orange color fades to tan, with two dull-orange stripes running lengthwise along the center line of the body. The head capsules of these later instar larvae are also tan, and the underside is somewhat lighter. Shortly before pupation, the larvae take on a green color. At this point they are about 14 mm. long.

The pupae are about 7 mm. long. When newly formed they are bright green, but they turn brown within 48 hours.

Habits

The eggs are laid singly on the needles, aligned with the needle's long axis, and are usually placed adjacent to one of its edges. At Placerville, Calif., in the Sierra Nevada foothills about 2,700 feet above sea level, the oviposition period is from about mid-June to mid-August. The current year's foliage is preferred as an egg-laying site.

Hatching takes place in about 10 days. The larvae bore directly down through the bottom of the egg into the needle, and position themselves within the angle made by the needle's curved outer surface and one of its flat inner ones. The head of the larva is directed toward the tip of the needle. In this stage of development the insect is a true needle miner.

In the southern part of the needle-sheath miner's range, at least, the larvae overwinter in the first instar, feeding and lengthening the mine when temperatures are favorable for activity.

During this period the larva constructs a mine no wider than itself, remaining pressed into the angle of

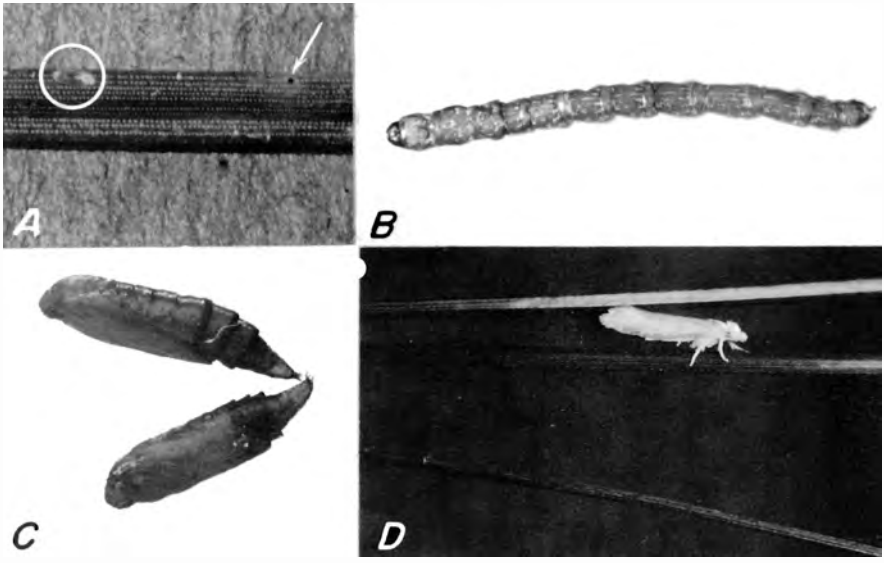

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Figure 2.—Life stages of the pine needle-sheath miner. *A*, Egg (×10) (circle) and entrance hole from which abandoned egg has been removed; *B*, needle-mining larva (×40); *C*, pupae (×5); *D*, adult (×3).

the needle. The frass is packed back in the mine, and as it dries it turns yellow and becomes visible as a thin line along the needle edge.

In the spring, about the time the new pine shoots begin to lengthen, a distinct change in larval activity takes place. Previously sluggish, the larva now becomes very active. It moults into the second instar, widens the mine, and moves toward the center of the needle. After making about 5mm. of this wider mine, the larva bores out to the surface and abandons the needle.

The destructive part of the insect's life cycle then begins. Larvae move to the new growth and begin feeding within sheaths of the tender young needles (fig. 3). The final three larval instars are passed in this manner.

During the first week or so of this sheath-mining period, the larvae are small enough to enter the needle bundle to feed. However, toward the end of the larval stage only the head and first few segments are inserted.

By the time it pupates, 3 to 4 weeks after starting sheath-mining, each larva has damaged or destroyed 6 to 10 fascicles of needles. Pupation takes place in the mass of silken webbing produced around the needle bases, and lasts about 10 days.

Control

Parasitism appears to play an important part in regulating needle-sheath miner populations. At Placerville in 1957, six species of parasites were reared from either larvae or pupae of the pine needle-sheath miner. Several species that are possibly parasitic also were reared. The most numerous parasites were of the wasp families Ichneumonidae, Braconidae, and Chalcididae.

Needle-sheath miner larvae can be satisfactorily controlled with a malathion-water emulsion. This

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Figure 3.—Needle sheath miner larva (lower arrow) in webbing on infested tip. Upper arrow points to hole through larva has fed.

may be prepared by mixing one pound actual or 1½ pints of 57 percent emulsifiable concentrate in 25 gallons of water. The spray is applied with mistblower or by aircraft at the rate of 25 gallons per acre as soon as the larvae have abandoned the overwintering needles.

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key—out of the reach of children and animals—and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fugicides that you use for herbicides.

Dispose of empty pesticide containers prompty. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

NOTE: Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Department of Agriculture, consult your county agricultural agent or State Extension specialist to be sure the intended use is still registered.

Reference

ROBERT E. STEVENS. BIOLOGY AND CONTROL OF THE PINE NEEDLE-SHEATH MINER, ZELLERIA HAIMBACHI BUSCK. U.S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. Tech. Paper 30, 20 pp., illus. 1959.

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U.S. GOVERNMENT PRINTING OFFICE: 1971 O—426-226