Ponderosa Pine Tip Moth

Robert E. Stevens [1]

The ponderosa pine tip moth, *Rhyacionia zozana* (Kearfott), is a pest of young trees in the foothill pine forests of the Sierra Nevada and Cascade ranges in California, Oregon, and Washington (fig. 1). In California, where it has been most commonly reported, this tip moth is generally found at elevations of 2,000 to 4,500 feet. It usually attacks trees less than 6 feet tall.

The larvae feed in the new shoots, causing varying amounts of tree deformation. There is one brood a year. Applied control is generally unnecessary.

Tip moth damage is usually neither spectacular nor serious. However, under certain conditions it can be important. This was demonstrated in 1962 and 1963 at a USDA Forest Service seed orchard near Placerville, Calif., where moths from the surrounding pine forests invaded plantations used in tree-improvement work. The progeny of these moths then destroyed newly grafted leaders of Jeffrey and sugar pines. This resulted in the loss of many manhours of highly skilled work.

Hosts

Ponderosa pine is the preferred host of the tip moth. It occasionally attacks sugar pine and Digger pine. At the Institute of Forest Genetics, Placerville, Calif., *Rhyacionia zozana* was found infesting 17 other pine species and hybrids, including Jeffrey pine, lodgepole pine, and western white pine. These species

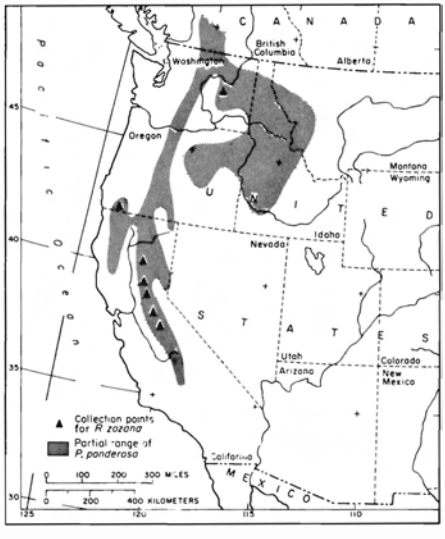

Figure 1.—Partial range of ponderosa pine and places where the ponderosa pine tip moth has been collected.

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would probably be suitable hosts when planted within the tip moth's natural range.

Evidence of Infestation

Fading of all or parts of new shoots in early summer is the first evidence of tip moth activity. The needles growing from the affected portion of the shoots cease to elongate, and they rapidly turn from the normal green color to a pale yellow. The dead tips remain rigid, the foilage slowly darkening until, by winter, it is a dull reddish brown. The tips are heavily mined out and are held in place chiefly by the outer bark, which is not eaten.

Close examination of attacked tips in the spring will reveal silken "tents" spun by the larvae around the buds and the bases of the needle bundles. These tents are relatively inconspicuous and are often overlooked. As larval feeding continues, the infested tips begin to fade, the tents become coated with pitch, and particles of frass accumulate around the area of the insects' activity.

A cluster of tough, silken cocoons at the base of a tree is another sign of tip moth infestation. Often this cluster will completely encircle the tree, forming a "collar" at the ground line. Drooping leaders are not associated with attacks by the ponderosa pine tip moth.

Damage

Damage to infested trees is caused by larvae mining in the new shoots. This results in the death of the bud and the mined-out portion of each infested shoot (fig. 2) and in the subsequent development of one or more new leaders. Ponderosa pines generally overcome this injury unless they are attacked repeatedly, and by the time trees are 8 to 10 feet tall, little evidence of damage remains. Heavy attacks year after year will seriously retard growth, however, and predispose trees to attack by other insects that commonly develop in weakened trees. The pine reproduction weevil, *Cylindrocopturus eatoni* Buchanan, is an example of such an insect. Tree mortality due solely to tip moth feeding has never been observed.

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Figure 2.—Ponderosa pine shoot killed by tip moth attack. New buds have developed below killed portion of tip.

Description

The tip moth adult (fig. 3, *A*) has a wing expanse of about 20 millimeters. The forewings are irregularly banded with gray and white on the inner two-thirds and are mostly brick red on the outer one-third. The hindwings are grayish brown. When the insect is at rest, it holds its wings in a rooflike position over its body.

The eggs (fig. 3, *B*) are nearly round, flattened, and about 1 mm. in diameter. When first laid they are a pale greenish yellow. As the embryo develops, the egg turns orange, and before hatching, the tiny larva can be distinguished inside.

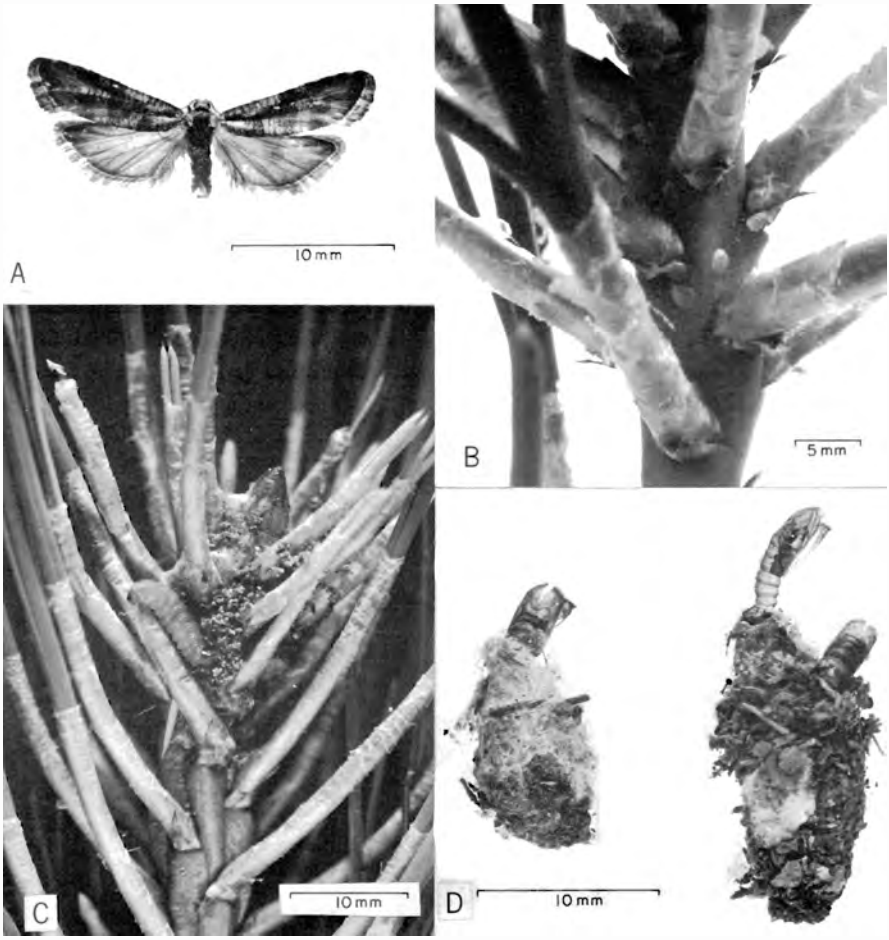

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Figure 3.—Ponderosa pine tip moth: *A*, Adult moth; *B*, eggs typically located on new shoots; *C*, fully developed larva on infested shoot; *D*, pupal cases protruding from cocoons.

Larvae (fig. 3, *C*) are generally orange. There are four instars. During the last two instars, a rosy color overlays the orange on the upper part of the thorax and the last three or four abdominal segments. The head capsule and anal plate are dark brown to black in the younger larvae and tan in the final two instars. Fully developed larvae are about 12 to 15 mm. long.

The pupae (fig. 3, *D*) typically occur in tough, silken cocoons. They are generally brown and measure 6 to 7 mm. long.

Life History and Habits

In California adult emergence begins in March or April (fig. 4), and oviposition begins soon afterward. The eggs are laid about the time elongation of ponderosa pine shoots is slowing down and the new needles are emerging from the fascicle sheaths and beginning to elongate. Most of the eggs are laid on the new shoots (fig. 3, *B*), although some are found on the older needles and shoots.

The eggs hatch within 2 weeks, and the tiny larvae move to a junction of a fascicle of needles and a shoot and join them together with a tent. The larvae feed within the protection of this tent, boring into the succulent growing point of the needle bundle and into the green bark of the new shoot itself. They coat the inner surface of the tent with resin exuding from the wounds in the tree, and the tent takes on a shiny, soapbubblelike appearance.

As development progresses the larvae begin mining into the shoot itself, feeding on the wood and the pith. The larvae commonly feed in groups. Generally they mine from the tip back toward the base of the shoot in an irregular fashion. Individual galleries usually are not identifiable. Most of the wood within the infested portion of a tip is destroyed, but occasionally pieces of tissue will be left in place. Almost

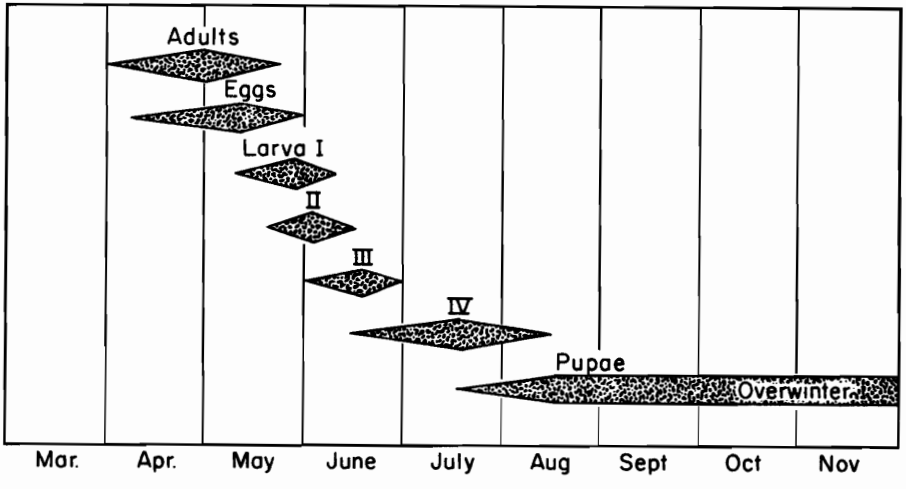

Figure 4.—Life cycle of the ponderosa pine tip moth in California.

all frass is pushed outside (fig. 3, *C*).

Mining ceases in the early summer. Most of the larvae then crawl out of the tips and down to ground level where they spin their cocoons, firmly attached to the bark. A few spin their cocoons inside the mined tip or somewhere on the bark of the trunk. By autumn all have pupated; all pass the winter in the pupal stage.

Natural Control

In most forest situations natural factors operate to keep ponderosa pine tip moth populations under control. Important among these are parasitic insects, including a *Trichogramma* egg parasite and several larger ichneumonoid wasps. Most of these larger wasps probably attack the tip moth larvae; they develop at the expense of the host larva or pupa.

Applied Control

Because trees generally overcome tip moth damage, it is unnecessary under forest conditions to apply control measures. When protection is desired for seed orchards or other high-value plantings, the use of insecticides may be warranted. However, at this time no materials are registered or recommended.

Clipping off infested shoots before the larvae leave to pupate will reduce populations but will not lessen the current year's damage. Nevertheless, it can be a useful practice in some ornamental plantings. The clipped tips should be destroyed to prevent older larvae from completing their development.

Reference

THE PONDEROSA PINE TIP MOTH, RHYACIONIA ZOZANA, IN CALIFORNIA (LEPIDOPTERA: OLETHREUTIDAE). ROBERT E. STEVENS. Ann. Ent. Soc. Amer. 59(1): 186–192. 1966.

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