



FIGURE 1: Pitch tubes on the bole of lodgepole pine infested with *Dendroctonus ponderosae*.

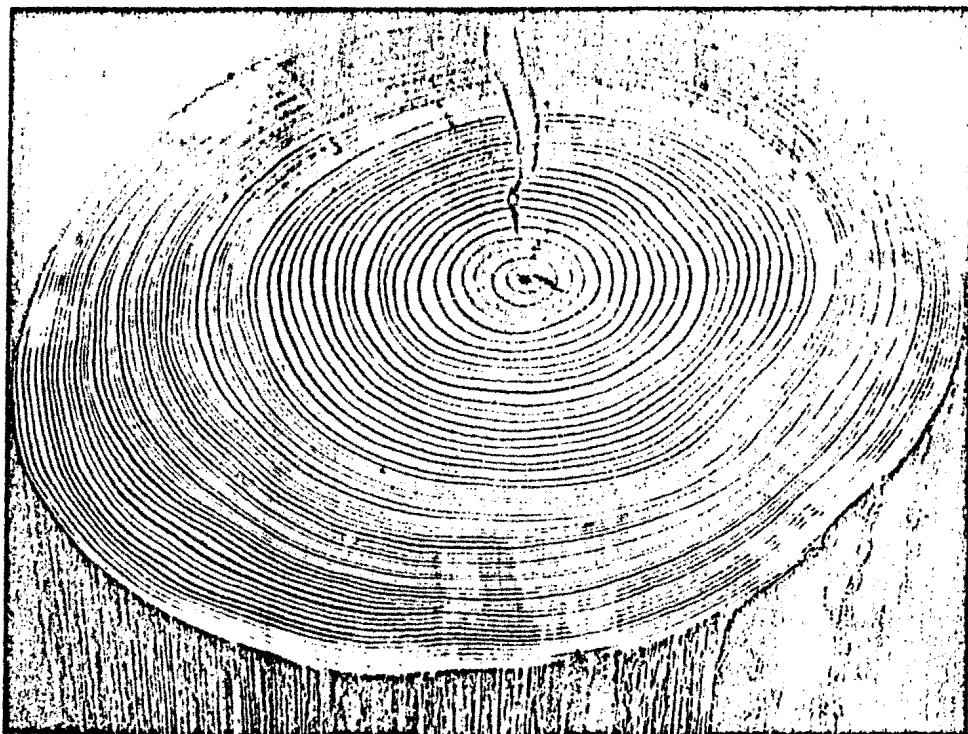


FIGURE 2: Blue stain caused by a fungus associated with the mountain pine beetle.

1. MOUNTAIN PINE BEETLE

Dendroctonus ponderosae Hopk.

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This species was recently combined with *Dendroctonus monticolae* Hopk. and *Dendroctonus jeffreyi* Hopk., but current work on the latter indicates that it may be resurrected as a separate species. The common names have not been resolved, but "mountain pine beetle" is generally being used and probably will be retained.

Approximately 235 million board feet of lodgepole, western white, ponderosa, and sugar pine were killed annually by the mountain pine beetle in 1961 and 1962 in western United States. Exclusive of Vancouver Island, some 190 million board feet of western white, lodgepole, and ponderosa pine were also killed in British Columbia in the 10 years from 1951 to 1960. The potential impact of a mountain pine beetle epidemic is the elimination of virtually all host trees more than 8 inches in diameter within the area of infestation.

Distribution

The mountain pine beetle occurs in the western United States and Canada, from British Columbia and western Alberta to northern Mexico, and from western Oregon and Washington to Colorado and South Dakota.

Hosts and Description of Damage

Lodgepole pine, western white pine, ponderosa pine, sugar pine, whitebark pine, and limber pine are attacked by the beetle.

Individual attacks on host trees can usually be recognized by reddish-brown to yellowish-brown "pitch tubes" on the bole from the ground to mid-crown (Fig. 1). These tubes are formed by resin and boring dust which is extruded from the entrance hole made by the attacking beetle. Unsuccessful attacks, called "pitch outs", are the result of copious flows of resin which prevent the establishment of attacking beetles. Successful attacks occur when there is insufficient resin flow to inhibit beetle establishment; sawdust is the only external sign of such attacks. Associated with the beetle are blue-stain fungi, whose colonization appears essential to successful attacks and brood establishment (Fig. 2).

In addition to pitch tubes, foliage discoloration is also evidence of infestation. Yellowing of foliage can begin within 3 to 4 weeks after attack, but this usually occurs the following spring. During the season following attack, the foliage becomes a deep, reddish-brown. A few years later the tree has shed practically all its needles.

Life History

The seasonal history varies with locality and elevation. Beetle flight occurs between mid-June and mid-September, but can extend into November. Attacks on the host tree are initiated by the female beetles boring through the bark of the bole to the cambium layer. At this time, male and female beetles are attracted



FIGURE 3: Typical feeding galleries showing characteristic pupal cells.

to successfully attacked trees, which increases the population on non-resistant trees. Mating occurs within the gallery, usually, when 1 or 2 inches of the egg gallery have been excavated. The males usually remain with the mated females, but some may leave.

The straight or sinuous egg galleries run parallel to the wood grain and are excavated by the adult females—mostly in the inner bark—though the wood is scarred slightly. Eggs are laid singly in niches along the sides of the gallery as it is constructed. Within 1 to 3 weeks eggs hatch and larvae begin to excavate feeding galleries in the inner bark more or less at right angles to the egg galleries (Fig. 3). Immature larvae overwinter *in situ* and feeding is resumed in the spring. Upon reaching maturity, the larvae excavate oval pupal cells, transform to pupae, then to callow adults, and finally to mature adults. This transformation may take several weeks before the mature adults bore through the outer bark and fly to attack new host trees.

Control Measures

Several control measures are effective against the mountain pine beetle, but all require individual treatment of trees containing live broods, and for this reason are expensive. Chemical control has been accomplished with orthodichlorobenzene in diesel oil, but this has been replaced to a great extent by a water emulsion of ethylene dibromide. Recently, a 1.5 per cent lindane-diesel oil solution has shown considerable promise. Spraying can begin as early in spring as the weather permits. It should be discontinued when approximately 50 per cent of the beetle population has reached the teneral adult stage. Spraying can commence again after the beetle flight is over, and can be continued until winter weather prohibits travel. The insecticide is usually applied with a "stirrup pump" having extension rods fitted with spray nozzles. However, when infested trees have been felled, even ordinary garden watering cans can be used to apply the insecticide. Modifications of these methods include pressure cans and motor driven pumps.

Various other methods have been tried with varying degrees of success, such as burning standing trees, decking and burning, and large-scale pushovers with caterpillar tractors.

Control by management should be the ultimate goal. In too many cases, however, epidemics begin in overmature stands where it is already too late to attempt control of a current infestation by cultural methods. Management methods, to be effective, should be designed to prevent rather than control epidemics.

Selected References

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