



TREE NOTES

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Ips Beetles in California (Coleoptera:Scolytidae)

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Bark beetles of the genus *Ips* are important pests of pine and occasionally spruce in western forests. Damage caused by these insects is considered second only to that caused by bark beetles in the genus *Dendroctonus*. Trees top-killed by *Ips* are often attacked and subsequently killed by *Dendroctonus* beetles. In California the most destructive species of *Ips* is the California fivespined ips, *Ips paraconfusus*.

Under normal conditions, *Ips* beetles attack recently dead or broken branches and the tops of stressed trees. Tree mortality is generally restricted to scattered saplings and poles that are suppressed, diseased, or injured. Widespread mortality and top-killing typically occur during drought years when water stressed trees are less able to repel beetle attacks. Trees may also be predisposed to beetle attacks by storms, lightning, fire, logging and construction injury, and by severe competition for light, minerals and water, common in overstocked stands.

Outbreaks can also occur when large quantities of fresh slash, produced by logging operations, accumulate between February and June. Upon emergence in the spring, the overwintering adults colonize the slash resulting in beetle population build-up. As greater numbers of beetles emerge, they may attack and kill nearby host trees. Although outbreaks usually last no longer than one season they can last longer during extended periods of drought.

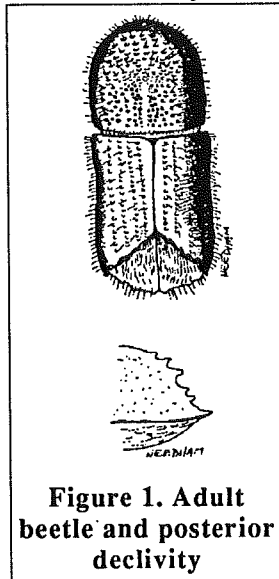


Figure 1. Adult beetle and posterior declivity

Description of Life Stages

Adult *Ips* beetles are cylindrically-shaped, reddish-brown to black, and 1/8 to 1/4 inch (3.0 - 6.5 mm) in length. Adults can be distinguished by the declivity (concave area) at the rear end of the wing covers (elytra) (Fig. 1). The margin of this declivity has three to six tooth-like spines along each side. The number, shape and length of the spines, together with host tree species, geographic location, and gallery pattern are used in species identification. Full-grown *Ips* larvae are small (1/8 to 1/4 inch in length), legless, nearly white, and C-shaped.

Symptoms of an Ips Beetle Infestation

Ips attacks are signalled by yellow or reddish boring dust in bark crevices, around entrance holes, or in piles on the ground below the entry point. Usually, no pitch tubes are formed.

Often, the first symptom of a successful beetle attack is seen in the tree's crown. Foliage color changes from green to yellow and eventually to reddish-brown. Color change occurs quickly in the summer, and more gradually in the fall and winter. The new brood has usually left the tree by the time the foliage has faded.

Ips gallery systems are distinguished by the presence of a single entry hole with up to three maternal galleries radiating from it (Fig. 2). The maternal galleries are free of boring dust (frass). By contrast *Dendroctonus* spp gallery systems have a single maternal gallery per entry hole and they are packed with frass.

Blue-stain fungus is typically introduced by attacking *Ips*. The fungus plugs the tree's water conducting system, which inhibits its defenses. This makes it easier for the beetles to colonize the tree. As the tree dies, the sapwood is stained blue.

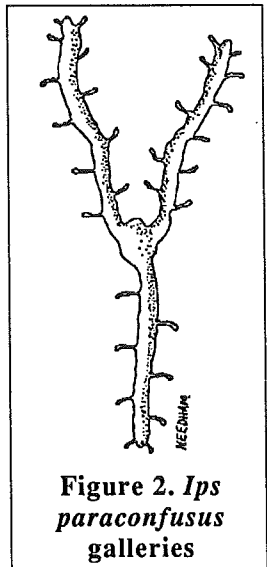


Figure 2. *Ips paraconfusus* galleries

Life History

In the spring, adult male *Ips* emerge and initiate attacks on stressed trees or fresh slash by boring through the bark. As they bore, males emit chemical attractants (population aggregation pheromones) which, in conjunction with host tree chemicals, attract both sexes of adult *Ips*. A small cell or nuptial chamber, several times larger than the male beetle, is constructed in the inner bark. Each male is joined in the nuptial chamber by up to three females. After mating, each female constructs a maternal gallery where up to 200 eggs are laid, each in its own niche, along either side of her maternal gallery. Upon hatching, the larvae feed in the inner bark. Larval tunnels gradually widen as they radiate from the egg gallery and are packed with frass. After completing

development, each larva constructs an oval pupal chamber where it becomes an adult beetle.

Complete development from egg to adult takes about 1-1/2 to 2 months in summer. Two to five generations develop each year depending on altitude, latitude, exposure, and beetle species. The number of generations at a given location is also influenced from year to year by seasonal temperature variations. *Ips* usually overwinter as adults, although egg, larval, and pupal stages may also be found.

Management

A number of predators and parasites attack *Ips* beetles, but *Ips*' population numbers are primarily regulated by the availability of suitable host material. Rapid population build-up occurs when a large amount of fresh slash is available in the spring. When overwintering adults emerge, they attack fresh slash rather than standing trees. During the spring, standing trees are not moisture stressed so they are able to produce sufficient quantities of pitch to repel attacking bark beetles. Pitch production is the tree's defensive reaction to wounding and beetle tunneling. As moisture stress increases later in the season, subsequent beetle generations are more likely to attack the tops, and later the entire bole of standing trees. Once beetles have successfully infested a tree, it cannot be saved.

1. Direct Control. Direct control efforts such as burning infested wood, peeling logs, and applying insecticides have not proven to be effective once attacks by *Ips* beetles have become epidemic. Some success may result if the infestation is detected early and the trees are salvage-logged, treated with insecticide, or burned before the brood emerges. Direct control should be considered only in high-value stands of limited size, and only for a short time as costs can be prohibitive. In urban areas direct control can effectively protect single trees.

Protective insecticidal treatments are difficult to apply because the entire trunk must be sprayed to provide adequate protection from attacking beetles. Ground application equipment is usually inadequate for taller trees. These treatments will not kill the brood under the bark, but can kill the emerging beetles. Injection of systemic insecticides has not proven effective in controlling bark beetles.

2. Biological Control. A number of native insect parasites and predators, along with other organisms such as nematodes and woodpeckers attack *Ips* beetles. Under natural conditions these enemies play a role in stabilizing *Ips* populations; however, pesticide application may disrupt this natural control.

3. Prevention. The best way to reduce pine mortality from *Ips* beetle attacks is through proper stand management. Maintain the vigor of the stand through stocking control, increasing species and size diversity, and minimizing activities such as construction or logging that damage trees and compact soils. Pines should be grown and maintained on true pine sites, not in chaparral zones where they are stress-prone and subject to *Ips* attack.

Pine mortality can also be reduced by preventing beetle population build-up in slash. This is especially important during a dry spring. From February through June, lop all slash greater than 3 inches in diameter and scatter, preferably in full sun. Remove branches from boles. When green wood is cut into small pieces, it will dry out before a beetle brood can fully develop. Slash generated in the fall may be colonized, but the material will normally degrade to such an extent that little or no brood will emerge the following spring.

In landscape situations, avoid tree stress! Plant pine species suitable for your site and maintain good tree vigor. Postpone or restrict pruning, thinning and nearby construction when trees are stressed, especially during droughts. Do not compact soil within the roots zone, injure crowns or stems, change soil grades, or alter soil drainage. Properly applied water and fertilizer will increase vigor in ornamental pine plantings and provide some protection from *Ips* attack.

Freshly cut pine firewood should be kept well away from standing trees and covered with clear 6 mil (ultraviolet-resistant if available) plastic to expedite drying and exclude *Ips* beetles from colonizing the wood. See *Tree Notes* Number 3 for details on tarping.

Further Reading

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