

SOME FOREST INSECTS OF THE
LAS POSADAS REGION

(This list of insects was suggested by
Mr. Paul Keen of the Division of Forest
Insect Investigations and descriptions
were adapted from his "Insect Enemies
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Enemies of the Pines

Pine Bark Beetles

No group of commercially valuable trees in western forests has more insect enemies than the pines, and of these, bark beetles are the most numerous and destructive. The most aggressive bark beetles attacking western pines are the so-called pine beetles, which belong to the genus Dendroctonus. Several species in this group are capable of attacking and killing normal healthy trees. The damage they do in western pine forests runs into millions of dollars annually.

The next most important group comprises the pine engraver beetles belonging to Ips, Pityogenes, and related genera. These beetles usually work under thinner bark and make very striking and distinctive forked or star-shaped gallery patterns. While they normally breed in weakened, dying, or felled trees, or in broken branches and slash, and are to that extent beneficial in hastening the disintegration of forest debris, they occasionally develop in sufficient numbers to become primary enemies of young trees and of the tops of older ones.

There is also a third group of bark beetles comprising a large number of species that are secondary in their attack and are seldom responsible for the death of any trees. Many of these are found feeding under the dying bark of pines that are being killed by other bark beetles, fire, or other causes, and sometimes are confused with primary species. Space will not be taken for a description of all the bark beetles that may be encountered, for it is usually sufficient for all practical purposes if the forester learns to recognize species of chief importance.

Dendroctonus Beetles

The pine beetles that are members of the genus Dendroctonus (meaning tree killers) make up by far the most destructive group of bark beetles attacking pine trees in North America. All species breed under the thick bark of the trunk of living or dying trees or in fresh stumps or logs of various pines. Some species prefer felled, weak, or dying pines, whereas others apparently prefer normal, healthy pines for their attack.

The adults are stout, cylindrical, dark, reddish-brown to black bark beetles ranging from $1/8$ to about $3/8$ inch long. The eggs, larvae, and pupae are similar to those of other bark beetles. These beetles are monogamous in habit and each pair constructs a single egg gallery which, starting from the outside, penetrates to the cambium and is extended between the bark and wood. Egg galleries differ in that some wind in a tortuous manner, crossing and recrossing the galleries made by other pairs of beetles, while others are straight and parallel to the grain of the wood. Dendroctonus egg galleries are always packed with boring dust, except

for an inch or two at the end where the beetles are working. This will distinguish the work of the *Dendroctonus* beetles from that of other groups of bark beetles.

Trees attacked by *Dendroctonus* beetles can first be distinguished by reddish boring dust caught in bark flakes or crevices and around the base of the tree, or by pitch tubes that form on the bark at the mouth of the entrance tunnels, but in heavily attacked or decadent trees pitch tubes are often either missing or so small that they can be seen only from a short distance. Later, discoloration of the foliage furnishes a more noticeable evidence of attack. It is difficult, however, to correlate accurately the discoloration with the status of brood development, as this varies with different tree species, regions, and seasons. The most conclusive evidences of attack are the egg and larval galleries on the inner surface of the bark. These form a pattern so characteristic for the work of each species that, when considered with locality and host tree, the identification of the species responsible for the attack is relatively simple.

Western Pine Beetle

The Western Pine Beetle (*Dendroctonus brevicornis* Lec.) is the most important insect enemy of ponderosa and Coulter pine within the range of these trees from Baja California north into Oregon, Washington, Idaho, Montana, and western Canada. Other pines may be attacked under exceptional conditions. Normally this beetle breeds in a few overmature trees, in windfalls, unhealthy trees, or in trees weakened by drought, stand stagnation, or fires. Under epidemic conditions it becomes aggressive and kills apparently vigorous trees of all age classes having bark sufficiently thick to protect the insect in its development. Trees under 6 inches in diameter are seldom attacked, nor does this beetle breed in limbs. The heaviest losses of mature merchantable ponderosa pine have resulted from outbreaks of this insect in California, Oregon, and Washington. It is less important in the more northern limits of its range. Losses as high as 50 per cent of the timber in 5 years have been recorded, and many large blocks of pine timber have been commercially ruined by its depredations.

The adult beetles are about the smallest of the western species of *Dendroctonus* and measure from $1/3$ to about $1/5$ inch long. The larvae found in the outer bark are white, curved, and about the size of a grain of rice. Their work is distinguished from that of other bark beetles within the same range by the winding egg galleries which cross and recross each other, forming a network of irregular markings on the inner surface of the bark and on the surface of the sapwood. The larvae feed in the inner bark, working away from the egg gallery for about half an inch and then into the outer bark, where they complete their development. Flight and attacks start late in the spring or early in the summer and continue until stopped by cold weather. There are from one to two generations annually in the northern part of range and from two and one-half to four generations in the southern portion, where activity continues almost without interruption throughout the year.

Woodpeckers, clerid beetles, and ostomatid beetles are important natural enemies of this insect, though its abundance is more often determined by climatic influences and the resistance of the host tree. Prolonged winter temperatures of -20° F. and lower have been found to cause heavy brood mortality. Rapid, vigorous tree growth increases host resistance and discourages epidemics.

This bark beetle has been most successfully controlled through sanitation-salvage logging, by which high-risk trees are removed from the stand and utilized for lumber, thus depriving the beetles of susceptible host material. Direct control may be recommended, particularly for parks and recreational areas, when epidemics appear to be developing, and for maintenance control. Direct control measures consist in felling the infested trees, peeling, and burning the bark late

in the fall, or in winter or early spring. Such control work has been successful in reducing infestations during critical periods, but cannot be relied on to eliminate them and must be repeated until natural control factors become operative.

See also U.S.D.A. Circular 864 - The Western Pine Beetle by J. M. Whiteside (1951).

Red Turpentine Beetle

The Red Turpentine beetle (*Dendroctonus valens* Lec.) attacks the base of injured, dying or healthy trees, or freshly cut logs and stumps of all pines and occasionally spruce, larch, and fir, throughout the western and northeastern parts of the United States and southern Canada. Ordinarily it is not considered an aggressive tree killer but it does do considerable primary damage and so weakens trees as to make them more susceptible to attack by other bark beetles. In some infestations, as in Monterey pine California, it causes sufficient damage to kill the tree. It is particularly active around logging operations, where it not only works in the stumps, but often produces catfaces on the bases of trees left in the reserve stand.

The adults are the largest bark beetles of this genus, measuring from 1/4 to 3/8 inch long, and are distinctly reddish in color. They are often called barber beetles by woodsmen, because of their ability to clip hairs, and are commonly, though erroneously, thought to be the bark beetles responsible for the destruction of pines. Their attacks are characterized by large reddish pitch tubes that form at the point of attack. On burrowing under the bark, the beetles excavate irregular longitudinal egg galleries between the bark and the wood. These galleries range from a few inches to several feet in length, as Patterson reports finding one gallery extending underground along a root for 15 feet from the point of entrance. The galleries are more or less packed with frass, and eggs are laid in groups or masses at intervals along the sides. The larvae feed out through the inner bark in mass formation, producing a cavity ranging from a few square inches to a square foot or more in area, between the bark and wood. These chambers are often filled with a resinous liquid that apparently has no injurious effect on the developing broods. Transformation to the adult stage occurs within pupal cells constructed in the boring dust of the brood chamber or in short mines along its margin.

There may be one or more generations annually, depending on locality and season. In the more southern range of the beetle it can be found in all stages of development at nearly any season of the year. The heaviest attacks occur in midsummer, and the winter is passed as larvae, new adults, and parent adults, in trees and stumps attacked the previous season.

Though this beetle is seldom of serious importance in commercial timber stands, should control measures become necessary, the broods can be destroyed by removing the bark from fresh stumps and from the base of infested trees. For the protection of individual park or shade trees, the damage can be halted by cutting out the attacking beetles with a knife or chisel as soon as pitch exudations indicate their presence. Successful control also has been obtained by injecting carbon disulfide into the galleries.

Ips Engraver Beetles

Smaller species of bark beetles, which work in the trunks and larger branches of pines and construct egg galleries that radiate from a central nuptial chamber and form distinctive patterns, are frequently referred to as the pine engraver beetles. These belong to Ips, Pityogenes, Orthotomicus, and related genera.

These bark beetles normally feed on the cambium of weakened, dying, or recently felled coniferous trees and are capable of developing in large numbers in such material as windfalls, snowbreak, logging and road slash, and also the tops of trees killed by Dendroctonus or other beetles. They are beneficial insofar as they help in the reduction of forest debris, but if large quantities of favorable host material are available they frequently develop and emerge in such numbers as to attack and seriously injure or kill adjacent groups of healthy trees. Under such conditions they are often exceedingly destructive to seedlings, saplings, and young second-growth poles, and the tops of older trees. While Dendroctonus beetles prefer to attack the thick bark of the main trunk and are, therefore, more destructive to mature trees, the engraver beetles usually select thin-bark trees for attack, thereby qualifying as primary enemies of younger trees. Some species are frequently found working in association with Dendroctonus beetles, in which case their attack is usually secondary, although some top-killing of trees by these engraver beetles precedes and possibly attracts subsequent infestation by Dendroctonus beetles. With the removal of mature forests, some authorities consider it likely that this group of bark beetles will outrank the Dendroctonus beetles in destructiveness to the second crop of pines.

The first evidence of attack by Ips beetles is yellow or reddish boring dust in bark crevices, or little piles of such dust around the entrance holes or on the ground beneath. Pitch tubes are seldom formed, and the boring dust is usually dry and free from pitch. Within 2 or 3 weeks after a tree has been attacked, the foliage fades and turns from green to yellow, sorrel, and red.

Attacks are made by these bark beetles with the coming of warm weather in the spring. An adult male bores through the bark and constructs a small cell or nuptial chamber in the inner bark. Several females then join in the work and each constructs an egg gallery in which eggs are laid in niches along the sides. The larvae, upon hatching, feed in the inner bark and work away from the egg galleries, leaving gradually widening, excrement-packed tunnels behind them.

Engraver beetles have a number of predaceous and parasitic enemies, but apparently these do not affect the numbers of the beetles so much as does the lack of suitable host material. Given a quantity of freshly cut slash or windfalls, a large beetle population is almost certain to be produced but it will not long survive after the supply of this material is exhausted.

The Western Six-Spined Engraver

The western Six-Spined Engraver (*Ips ponderosae* Sw) is a secondary enemy of ponderosa and digger pines. For the most part it attacks trees that have been felled or those dying from attacks of more primary species of bark beetles. The adults are about 1/4 inch long, reddish brown to black, with six spines on each side of the elytral declivity. The gallery pattern consists of two to five egg galleries extending up and down the tree from the central nuptial chamber. Though the pattern is similar to that of I. oregoni, the galleries are distinctly wider. This beetle has been recorded from Arizona, California, Montana, South Dakota, and Colorado and undoubtedly is present in other Western States.

The California Five-Spined Engraver

The California Five-Spined Engraver (*Ips confusus* (Lec.) is destructive to saplings, poles, young trees up to 30 inches in diameter (breast high), and the tops of mature trees. It commonly attacks ponderosa, sugar, western white, Coulter, digger and Monterey pines, and, less frequently, other pines in California and southern Oregon west of the Cascade and Sierra Nevada ranges. It breeds readily in slash and felled logs, and the broods developed in such material often cause extensive damage to the young pine growth in the vicinity.

The adults are reddish brown to pitch black, about 3/16 to 1/5 inch long, and have five spines on the margin of each side of the elytral declivity. The egg galleries usually comprise from three to five nearly straight tunnels radiating from a central entrance chamber. The typical form has three galleries in the shape of an inverted Y. The galleries are not packed with boring dust and are usually from 5 to 10 inches long. Attacks are started early in the spring and from two to five generations of beetles may develop during the summer. In the northern part of the range, at an elevation of about 3,000 feet, there are usually two summer generations which develop in fallen logs and a third, or overwintering generation, which develops in standing trees. At lower altitudes and in the southern part of the range there are from three to five summer generations. Most of the beetles overwinter in the adult stage, under the bark of recently killed trees.

Some attempts have been made in California to control outbreaks of this beetle in young pine stands by felling the trees and burning the infested bark during the winter and early spring months, much as is done in the control of the western pine beetle. Usually such methods are not warranted, as outbreaks are sporadic and can be avoided if roadway, line, or other slash created late in the winter, in the spring, and in the summer months is burned or lopped and scattered where it will be fully exposed to the sun. Such precautions are especially important in years showing a marked deficiency in spring precipitation.

The Digger Pine (*P. sabiniana*) is attacked by *Ips* Engraver beetles and by the Red Turpentine Beetle.

Enemies of Douglas Fir

Douglas fir as well as the pines has its full share of insect enemies.--- Where growth conditions are less favorable and the timber of inferior quality, bark beetle outbreaks of disastrous proportions are not an uncommon occurrence. The Douglas fir beetle causes most of the damage. Small Douglas firs are frequently killed by fir engraver beetles, particularly where large numbers of these small beetles have developed in windfalls or slash.

The Douglas Fir Beetle

The Douglas fir beetle (*Dendroctonus pseudotsugae* (Hopk.)) is the most important bark beetle enemy of Douglas fir throughout its range in the Western States. It also attacks western larch. Normally it confines its attacks to felled, injured, or weakened trees and is not of great importance. At times, however, it becomes aggressive and kills apparently healthy, mature trees, singly and in groups, over extensive areas. Some serious epidemics have occurred in the Rocky Mountain region, particularly where trees were weakened by drought, fires, or defoliations, or where trees close to logging operations have been attacked by broods developed in slash. In the commercial Douglas-fir region of Oregon and Washington outbreaks are of less frequent occurrence, although the killing of groups of mature trees in second-growth stands is not uncommon.

Reddish or yellow boring dust caught in bark crevices or around the base of trees gives the first evidence of attack by the Douglas-fir beetles, as no pitch tubes are formed. The adults are reddish to dark brown, often black, beetles about 1/5 inch long and very similar to other *Dendroctonus* beetles except for their reddish color and their covering of conspicuous long hairs. These beetles work in pairs and construct egg galleries which are mostly in the inner bark, though they also slightly etch the sapwood. Typical galleries are perpendicular, usually straight or slightly sinuous and average about a foot in length, though they may range from 6 to 30 inches. The eggs are laid in masses of 10 to 36 in grooves, at laternate intervals along the sides of the gallery.

Ordinarily the Douglas-fir beetle passes the winter in the adult stage, although small to mature larvae also may be found. The overwintering adults emerge rather early in the spring, but the delayed broods mature and emerge at any time throughout the summer months. It is also possible that some of the young overwintering larvae do not have time to complete their development before cold weather overtakes them in the fall, and consequently they are obliged to spend another winter in the host tree. One generation of beetles a year is probably the normal rate of development, but there is considerable overlapping and retardation of broods, somewhat obscuring the demarcation between generations.

The usual method of direct control is to fell the tree and cut the infested bole into logs, which are then decked and burned. As a large percentage of these insects overwinter as adults and emerge early in spring, fall control is the most effective.

See also U.S.D.A. Circular 817 - The Douglas-Fir Beetle by W.D. Bedard (1950).

The Flatheaded Fir Borer

The Flatheaded Fir Borer (*Melanophila drummouli* Kby.) is the species of this group most frequently found throughout the West attacking Douglas-fir, true firs, and hemlocks. It also attacks western larch, spruce, and possibly other conifers. Though preferring trees that are dying or recently felled, the beetles sometimes attack and kill apparently healthy trees. The adults are from 3/8 to 1/2 inch long and are metallic bronze or black with an iridescent sheen. Some of the beetles have bright golden spots on the wing covers. *M. pini-edulis* Burke works in dying or dead pinyon in Colorado, Utah, Arizona and New Mexico.

Certain small, flat, nearly black metallic beetles, called firebugs are well known to fire fighters in the pine region on account of their prevalence around forest fires, where they gather in large numbers on the men's backs or bite them on the neck, arms, and hands. They appear to be strongly attracted by the smoke of forest fires; and during conflagrations, owing to some peculiar instinct, they try frantically to lay their eggs on the still smoldering trees. Several species of *Melanophila* have this habit, the most common offenders being *M. acuminata* DeG. and *M. consputa* Lec., which attack badly fire-scorched or weakened pines, spruces, firs, and other conifers, and even some hardwoods. The larvae feed in the inner bark.

Douglas-fir Twig Weevil

The Douglas-fir twig weevil (*Cylindrocopturus furnissi* Buch.) attacks and kills scattered small branches or tips on open-grown Douglas fir reproduction and plantations. Therefore it is of concern to those who are growing Christmas trees. These attacks may deform and retard the growth of the trees. Some trees less than 5 feet high may be killed outright; but by the time Douglas-firs have attained a height of 15 to 20 feet, they are no longer subject to appreciable damage. Adults emerge from the middle of June to the first week in August. After feeding for about 1 month, they deposit eggs in small punctures on stems and branches. The small larvae bore down to the surface of the wood, where they extend their feeding galleries. On approaching maturity, the larvae frequently bore through the wood into the pith. Larvae of all sizes overwinter, and pupation takes place the following spring chiefly during May and June. There is one main generation and possibly a partial second each year. Natural control is obtained through host resistance, competition for food, and abundant parasitism. Artificial control has not been attempted.

Redwood Bark Beetle (Phloeosinus sequoiae)

Redwood trees are remarkable for their resistance to serious injury by insects but one genus (Phloeosinus) is found on redwoods, Port Orford cedar, juniper and cypress trees.

As a general rule these small oval beetles are not aggressive in their attack and are found working under the bark of trunks, tops, and limbs of weakened, dying, or felled trees, or of broken branches. Occasionally, however, they become sufficiently numerous and aggressive to attack and kill apparently healthy trees. Usually the greatest injury by these bark beetles is due to their habit, as newly emerged adults, of feeding on the twigs of healthy trees, causing them to break or die. This habit is similar to that of most species of Scolytus. In constructing their brood burrows the beetles work in pairs, and, while there is some variation in the work pattern, the typical egg gallery consists of one short, longitudinal gallery arising from an enlarged entrance chamber, with the eggs very uniformly spaced along the sides and the larval mines extending laterally in a very regular pattern. Trees are attacked in the spring and summer, and there may be one or one and one-half generations a year. The only method of artificial control is to fell and burn the infested trees or severely scorch the bark.

OAK MOTHS

California Oakworm

California Oakworm (*Phryganidia californica* Pack.) is one of the worst pests of the Coast live oak, *Q. agrifolia*, and occasionally attacks other trees. It is particularly injurious to shade and ornamental oaks in the San Francisco Bay district, and not only renders the trees unsightly but may seriously weaken or even kill them.

The moths have a body about 1/2 inch long, and wings of light brown with darker veins and a spread of about 1-1/4 inches. The males are distinguished by yellowish patches near the center of the forehead and by their broader and more feathery antennae. Fullgrown caterpillars are about 1 inch long, and dark olive green, with conspicuous black and yellow longitudinal stripes on the back and sides.

The females lay eggs in groups of 2 to 40 on the under side of oak leaves, on tree trunks, or other convenient places. The young caterpillars skeletonize the leaves, and later, as they reach full growth, consume all the leaf. Two generations are produced each year. The moths fly in June and again in November. The winter is passed in the egg and early larval stages.

Natural enemies include the spined soldier bug, a tachinid fly, and several species of wasplike parasites. A wilt disease takes a heavy toll of the caterpillars during epidemics. As a result of these natural control agencies, outbreaks occur only at irregular intervals.

This defoliator can be controlled by spraying in March and April with lead arsenate or DDT emulsion sprays when the worms are very small and again during the latter part of July and early in August.

LEAF BEETLES

Alder Flea Beetle

The alder flea beetle (*Altica ambiens* 9Lec.) is a native species found throughout the Pacific Coast States, where it feeds on and skeletonizes the foliage of alder, poplar, and willow, both as larvae and as adults. The adults are small, dark shiny blue, and about 1/4 inch long. The mature larvae are a trifle over 1/4 inch long, dull brown to black, with shining black head and thorax and three pairs of short legs. The adults hibernate during the winter in debris beneath the trees and other sheltered places, appearing early in the spring to resume feeding. Clusters of yellow eggs are deposited sometime after the spring appearance of the adults. The larvae, which appear a few days later, reach maturity in August, and pupate on the ground in the duff. New adults appear in a week or 10 days and feed voraciously on the foliage until the close of the season, when they hibernate for the winter, to appear the following spring, completing the cycle of one generation a year.

LEAF MINERS

These insects cut little wavy tunnels in the leaves of many broadleaf trees but do very little serious damage.

Madrone Shield Bearer

The Madrone shield bearer (*Coptodisca arbutiella* Busck) mines the leaves of madrone and cuts out elliptical holes when constructing the pupal cases. Commonly associated with it in leaves of madrone is another leaf-mining species, Marmara arbutiella Busck.

INSECTS WHICH WORK IN SEASONED OR DECAYING WOOD

There are hundreds of kinds of insects which work in dead and down trees and which under natural conditions perform a service in putting dead wood material back into the soil where it can again be used by living trees. Such insects do much damage when they work in wood which is built into houses, fences, furniture or other objects used by man. A few of the more important which may be found in hardwood and conifer snags or down logs are --

Powder post beetles which are tiny brown beetles which make little holes in the sapwood of hardwood trees and gradually reduce it to powder. Some will be found in oak, laurel, madrone and maple, and a few of them work in dry conifer wood.

Carpenter ants tunnel through the wood of stumps, logs, dead standing trees and sometimes in the framework of houses. The wood is not eaten by the ants but cast out to make room for the nests, causing little piles of wood fibres to collect below the entrance holes. They live on caterpillars and the honey dew of aphids. Carpenter ants are interesting to see in the forest but are quite hard to control if they infest a building. The best preventive is to use treated foundation timbers and to put them up off the ground on good rock or concrete foundations.

Termites or "white ants" are very destructive wood boring insects as they excavate large cavities in the wood of buildings or in the forest in stump logs or dead trees. They are dirty white in color and live in the ground or in the wood in darkness only coming out into the light at swarming time when they for a short time are in the winged form. They are an interesting group of insects to study and a good deal of information is available about preventing their attacks in buildings. This as is the case with carpenter ants, consists mostly in using timbers poisoned by a good wood preservative such as creosote or pentachlorophenol and keeping the wood of the building up off the ground on a good sturdy foundation.

You can keep a colony of termites alive in a closed jar for several months by giving them a few chips of wood and a small amount of water occasionally.