# *Pine Root Collar Weevil*

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The pine root collar weevil *Hylobius radicis* Buchanan, is a native insect injurious to pines in eastern North America. In the United States it is present from the Atlantic seaboard (as far south as Virginia) northwestward to Minnesota. In Canada it is found in southern areas of the Provinces from Newfoundland westward to Manitoba.

The weevil attacks both young and old pines. Infestations are most severe in pine plantations and windbreaks, especially on poor sites. Natural stands are attacked, but damage is seldom heavy unless there are infested plantations nearby. Trees over 1 inch in diameter at the ground line are susceptible to attack. A well-stocked stand rarely supports a heavy weevil population after the crowns have closed.

**Hosts**

Several species of native and exotic pines are susceptible to attack by the pine root collar weevil. Scotch pine, *Pinus sylvestris* L., is the most severely damaged. It is least tolerant to attack and succumbs quickest; repeatedly infested trees smaller than 4 inches in diameter at the ground line die about 3 to 4 years after the first infestation. Most other species can withstand 5 to 6 years of repeated infestation.

Scotch, jack (*P. banksiana* Lamb.), and red (*P. resinosa* Ait.) pines, all of which are planted extensively within the weevil's range, are among the species most heavily attacked. Austrian (*P. nigra* var. *austriaca* A. & C.), Corsican (*P. nigra* var. *calabrica* (Loud.) Schneider), Mugho (*P. mugo* var. *mughus* Zenari), lodgepole (*P. contorta* Dougl.), and ponderosa pines are severly injured also; however, they are not planted as extensively in eastern North America. Pitch pine (*P. rigida* Mill.) is one of the least susceptible hosts. Eastern white pine (*P. strobus* L.) is rarely attacked unless adjacent to or planted with the highly susceptible species.

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**Figure 1.—Root collar of young red pine severely injured by larvae of the pine root collar weevil (below knife). (Courtesy Paul Flink, Michigan Department of Natural Resources.)**

## Damage

The larvae of the root collar weevil injure the bark and cambium of the host around the roots and root collar beneath the soil (fig. 1). This restricts transport of nutrients, weakening the tree and slowing its growth. Heavy winds

or snow cause weakened trees to lean or blow over at the ground line. Some heavily girdled trees die standing.

A swollen trunk at the ground line and darkened, pitch-infiltrated soil around the root collar characterize an advanced infestation. To detect the injured root collar, duff and a few inches of topsoil must be scraped away.

Adult weevils feed on the bark of the twigs but cause no appreciable injury.

Reduction in height growth is the first sign of damage to young pine trees from larval feeding. When the leader growth of some of the tallest trees in an even-aged stand about equals the leader growth of the shortest trees, a moderate to heavy weevil population is indicated. A few dead and dying (yellowing) trees indicate a severe infestation. A continued high infestation can wipe out the entire stand.

## Description[3]

The egg is oval, about 2 mm. long by 1.2 mm. wide, and nearly white to pale yellow. The embryo, when well developed, can be seen through the transparent shell.

The larva is white with an amber-brown head capsule (fig. 2*A*). It is legless and rests with its body in a curved position. When fully grown, it is 1 to 1.2 cm. long.

The pupa (fig. 2*B*) resembles the adult insect superficially and is about the same size. At first it is yellow white and very delicate; the mouth parts, antennae, legs, and wings are incompletely formed. As development continues, the appendages become more distinct. The body hardens and darkens, first becoming light brown, then deepening to a red brown by the time of emergence.

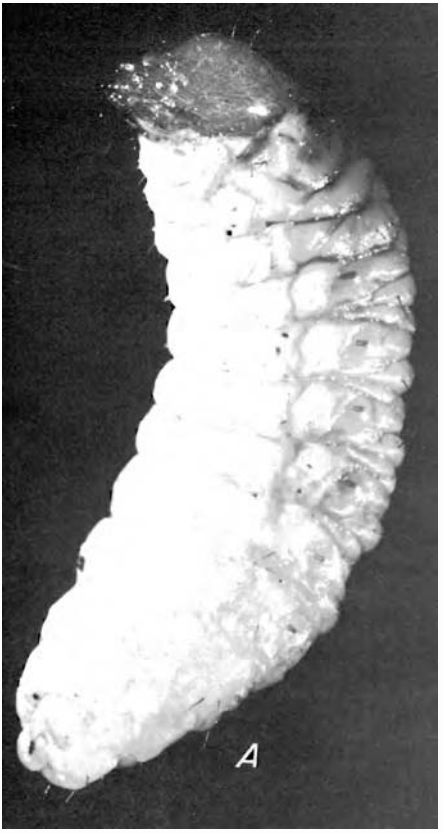
The adult weevil (fig. 2*C*) is an elongate snout beetle, dark reddish brown to nearly black. It is marked with irregular patches of white-to-yellow, hairlike scales. The wing covers have longitudinal rows of elongated indentations. Length of the adult weevil varies from 1 to 1.2 cm.

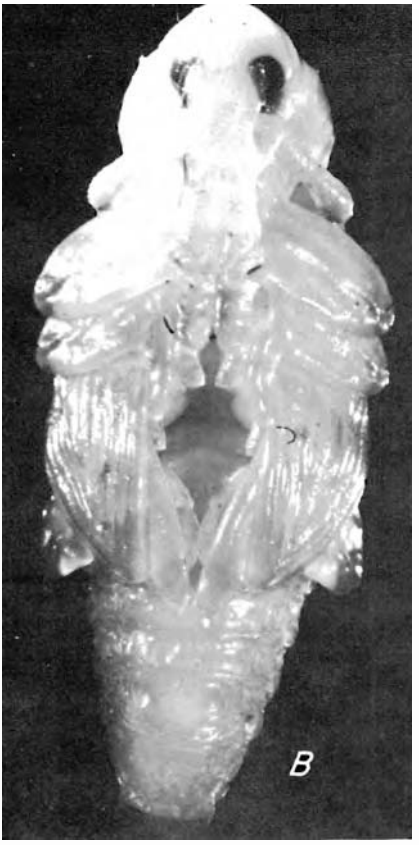
## Life History and Habits

In most localities, eggs are laid from early May to late September, the peak of egg laying occurring in late June or early July. The eggs deposited singly in cavities in the inner bark at the base of a tree or in the soil nearby. About 30 eggs are laid during the lifetime of the female adult.

Larvae hatch after 2 weeks. They penetrate the bark, then feed and excavate downward, widening their irregular gallery as they develop. Galleries are also made in the soil around the collar and are thought to serve as refuge during

[3] The description given here of the egg, larva, and pupa is identical to that of the egg, larva, and pupa of several species closely related to and often associated with the pine root collar weevil. An account of small differences in structure separating them is beyond the scope of this leaflet. The description given here can be used in determining whether a specimen belongs to this group of insects.



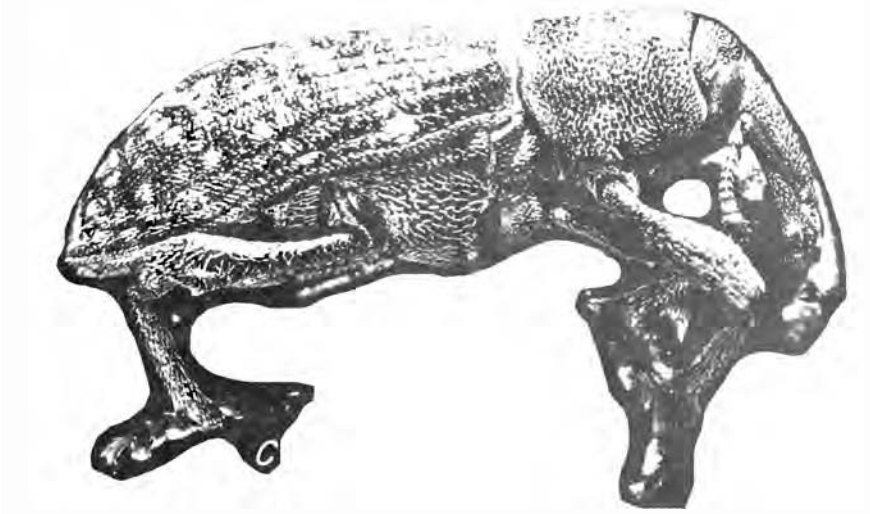




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**Figure 2.—Pine root collar weevil: *A*, Fully developed larva; *B*, pupa; *C*, adult. (About 8X actual size.)**

molting periods and perhaps for use in removing some excess pitch flowing from the injured tree. Larvae overwinter in galleries in the root collar in the third to last instars and complete their development the next season.

Pupation occurs from early June to September in a cell in the soil. Adults emerge from August to October. Little, if any, egg laying occurs before winter. Adults overwinter in the soil or in bark crevices and resume activity in spring. Adults are seldom seen since they rarely fly, remaining near the base of the tree during the daytime. There they feed on the bark of the duff-covered branches, mate, and lay eggs. During warm evenings they feed on the bark of the upper branches and travel to other trees. Most adults overwinter a second time and then are active for part of the following season.

In some localities the life cycle becomes complicated because some larvae from eggs laid in early May complete their development in time to pupate in the fall. These overwinter and emerge early the following year. In such areas, nearly all stages of development can be found during most of the year. All stages except eggs and very young larvae can be found in the winter.

### Similar and Associated Insects

One or more of at least seven species of weevils and one species of bark beetle may be present on the same trees inhabited by the pine root collar weevil. All resemble *Hylobius radicis* in either the adult or larval stages, but most have different habits. Only experts can identify most of them.

Two species, *Hylobius pinicola* Couper and *H. warreni* Wood, cause damage similar to that of the pine root collar weevil. However, *H. pinicola* prefers older trees and wetter sites and also attacks spruces and tamarack. Another closely related species, *H. rhizophagus* Millers, develops only in the roots of living pines. Little is known about another species, *H. congener* Dalla Torre.

*Hylobius pales* (Herbst) and *Pachylobius picivorus* (Germar) breed primarily in roots of dead and dying pines. *H. pales* pupates in cells constructed in the wood, and the adults feed commonly on the bark of seedlings.

The weevil *Pissodes approximatus* Hopkins and the bark beetle *Dendroctonus valens* LeConte breed in weakened trees and may be on pines infested by the pine root collar weevil. Their damage, however, is commonly found above and below the ground line.

### Natural Control Agents

In general, the immature stages of the pine root collar weevil are well protected from biological and climatic hazards. Eggs in the soil are subject to attack by mites and insect predators. Ants are common at the base of the tree and probably consume eggs and young larvae. One species of hymenopterous parasite has been reared from the eggs.

Larvae hatching from the eggs in the soil may starve if not established in the host tissue within 3 or 4 days. Larvae nearest the ground line are occasionally attacked by two hymenopterous parasites, *Bracon radicis* Shenefelt and *Coeloides* sp. Infrequently a larva is found diseased or entrapped in pitch in its gallery.

Excessive rain during the season can cause up to 15-percent pupal mortality. A bacterial disease also kills some pupae.

Adults that appear diseased are occasionally obtained from pupal cells. A carabid beetle, *Pasimachus elongatus* LeConte, feeds on the adult weevil. Overwintering mortality has not been determined for adults or larval stages.

None of the biological or climatic agents reported is effective in controlling pine root collar weevil populations.

### Silvicultural Practices

Buildup of pine root collar weevil populations can be slowed down or prevented in some locations by following these practices:

1. Whenever possible, avoid planting the highly susceptible pine species on light sandy soils when infestations of the pine root collar weevil are known to occur within 1 mile of the area.

2. Avoid planting mixtures of pines. Pine root collar weevil populations build up on the more susceptible pines and later attack and injure the more resistant ones.

3. Cut and destroy root collar of open-grown, older, susceptible "brood" pines in an area before planting new ones.

4. Maintain a fully stocked stand because a closed stand retards weevil buildup.

5. Prune the lower 2 to 4 feet of branches and rake away the duff beneath infested trees. This hinders the normal daytime activities of the adults because they prefer a cool, shaded environment. This need be done only once in a plantation for permanent control. The duff may need to be removed a second time after 4–5 years if trees are open grown or in windbreaks.

### Surveys

The following guides may be used in estimating pine root collar weevil populations and the need for control on young pines (4 to 15 feet tall).

Infestation is considered moderate to heavy when at least three larvae and pupae are found per tree—on the collar or in the pitch-infiltrated soil nearby. A simple yet reliable method of estimating the average number of insects per tree is to determine the percentage of trees infested by at least one larva or pupa per tree. On the average, when 80 to 85 percent of the trees are infested, at least three larvae per tree are present and control is recommended. At least 20 trees selected at random must be examined in a small stand, more in large stands. When some trees are already turning yellow or falling down, at least 95 percent of the trees are infested.

### Chemical Control

The weevil can be controlled by spraying the surface of the soil around the base of the trees. The area treated around a tree should extend 8 inches out from the base. To kill adult weevils, thoroughly wet the lower trunk.

To prepare the spray, mix into 100 gallons of water 1 quart of 20-percent lindane emulsifiable concentrate (containing 2 pounds of actual lindane per gallon). Or, mix into 100 gallons of water 1 pint of 40-percent lindane emulsifiable concentrate (containing 4 pounds of actual lindane per gallon).

### Pesticide Precautions

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 when they 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 fungicides that you use for herbicides.

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

**WARNING:** Recommendations for use of pesticides are reviewed regularly. The registrations on all suggested uses of pesticides in this publication were in effect at press time. Check with your county agricultural agent, State agricultural experiment station, or local forester to determine if these recommendations are still current.

### References

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