Dendroctonus valens

Other scientific names: *Dendroctonus rhizophagus*
Order and Family: Coleoptera: Scolytidae
Common names: red turpentine beetle; bark beetle

The red turpentine beetle, *Dendroctonus valens* LeConte, is a common pest of forest, shade and park trees of pole size or larger. It is native to North America and was accidentally introduced into China in the 1980s presumably on unprocessed logs imported from the western United States. Red turpentine beetles can be distinguished from engraver beetles by their larger size, reddish-brown colour and the presence of large, pinkish brown to white pitch tubes, a mixture of pine sap and beetle boring dust, on the lower trunk of infected hosts.

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Adult red turpentine beetle, Dendroctonus valens

DISTRIBUTION

Native: Latin America and the Caribbean: portions of Central America, Mexico (Wood, 1982)
North America (Wood, 1982)
Introduced: Asia and the Pacific: China (mid 1980s)

IDENTIFICATION

Eggs are shiny, opaque white, ovoid cylindrical, and a little over 1 mm in length (Smith, 1971). Larvae are grublike, legless and white with a brown head capsule and a small brown area at the hind end (Smith, 1971). A row of small, pale-brown tubercles develop along each side of the body. Full grown larvae are approximately 10 to 12 mm long. Pupae are white and slightly shorter than the larvae.

Adult beetles are typically long and stout, about 6 to 10 mm long and dark brown to black in colour with reddish-brown wing covers (Smith, 1971; Hagle, Gibson and Tunnock, 2003).

HOSTS

In its native range, hosts include: *Pinus* spp., including *P. resinosa*, *P. contorta*, *P. banksiana*, *P. strobes*, *P. rigida*, *P. echinata*, *P. radiata*, and *P. ponderosa*; *Picea* spp.; *Larix* spp.; *Abies* spp.; and *Pseudotsuga menziesii.* In its introduced range in China, hosts are primarily *Pinus tabulaeformis* and *P. armandii* and occasionally *Picea* and *Abies* species.

BIOLOGY

Peak flight and activity usually occur in the spring when adult beetles emerge from recently cut stumps and dying trees to attack trees, exposed roots, or freshly cut stumps (Smith, 1971). The female beetle bores through the bark to the surface of the wood where she is soon joined by a male. Typically one pair of beetles is found in an individual gallery but occasionally there may be one, three, or four beetles present. Resin mixed with boring particles and frass is pushed to the outer bark surface forming a pitch tube or dropping in pellets to the base of the tree (Smith, 1971).

Eggs are deposited on alternate sides of the gallery (Hagle, Gibson and Tunnock, 2003). The egg mass can extend from one to several inches along the gallery and the number of eggs it contains varies from a few to more than a hundred (Smith, 1971). The adult beetles continue to feed in the gallery for several weeks and then they either bore out through the bark and make additional attacks or die within the gallery. The eggs hatch in 1 to 3 weeks during the summer months.

Larvae feed gregariously in the phloem often forming fan-shaped galleries. Larvae are present for two summers after which they pupate and then overwinter the second year as adults beneath the bark (Hagle, Gibson and Tunnock, 2003). In standing trees, adults briefly emerge in their second fall and re-enter the tree to overwinter beneath the bark at the root collar where they are protected from the elements.

The rate of development and the number of generations per year are largely dependent on temperature (Smith, 1971). In warmer regions there is at least one generation per year while in northern areas at high elevations two years may be required for a single generation. In southern areas at low elevations, there may be as many as three generations per year.

SYMPTOMS AND DAMAGE

The red turpentine beetle usually attacks trees of reduced vigour or those infested with other bark beetles, but it can attack healthy trees. It is often found in association with other bark and wood-boring beetles such as *Ips* spp. and other *Dendroctonus* spp.

Attacks on standing trees are concentrated on the lower trunk and exposed roots. Large reddish-white pitch tubes on the bark or pellets on the ground around the base of host trees from mid-May to July are usually the first sign of infestation (Hagle, Gibson and Tunnock, 2003). Feeding by larvae and adults in galleries can completely girdle the trees resulting in death although this is not always the case. Host trees are inoculated with blue-stain fungi. Freshly cut logs with thick bark may be attacked and while they will not produce large numbers of beetles, they can multiply and threaten nearby trees (Smith, 1971). Attacks, especially on healthy trees, may last for two years or more. Severe attacks can kill trees.

Despite the abundance and wide distribution of *D. valens*, outbreaks have not been extensive or severe in the United States (Smith, 1971). The beetle has been found most frequently in individual trees or in groups of trees in localized areas. In China, however, it is considered an aggressive and very destructive pest of *Pinus tabuliformis*, China's most widely planted pine species. It was first detected in Shanxi Province in 1998 and widespread tree mortality was reported in 1999; this outbreak continues and has spread to three adjacent provinces causing unprecedented tree mortality (Yan *et al.*, 2005).

Pitch tubes evident on a host tree infested with Dendroctonus valens

DISPERSAL AND INTRODUCTION PATHWAYS

The beetles are strong fliers capable of flying more than 10 miles (Smith, 1971). This species can also be introduced into new areas on forest products and wood packaging materials as evidenced by its arrival in China in the 1980s.

CONTROL MEASURES

Once attacked a tree typically cannot be saved therefore preventive measures such as maintaining the health and vigour of forest stands by thinning or removal of overmature trees are the best tactics to reduce the impacts of this pest. Chemicals have been used in some areas and have been shown to help prevent attacks and kill beetles already beneath the bark.

In China, a variety of methods from informal surveys to the use of baited traps are used to detect and monitor *Dendroctonus valens* populations. In addition, investigations are underway on the use of the predator *Rhizophagus grandis* for biological control.

Damage caused by Dendroctonus valens *in the United States (left) and Shanxi Province, China (right)*