FOREST PEST SPECIES PROFILE

November 2007

Dendroctonus frontalis Zimmerman, 1868

Other scientific names: *Dendroctonus arizonicus* Hopkins
Order and Family: Coleoptera: Scolytidae
Common names: southern pine beetle; bark beetle; el gorgojo (Central America); tree killer

Dendroctonus frontalis is considered to be one of the most damaging species of bark beetles in Central America and southern areas of North America. It is a major pest of pines and has a wide distribution occurring from Pennsylvania in the United States south to Mexico and Central America.

Southern pine beetle. On the right, an adult is compared to a grain of rice and an adult black turpentine beetle (l-r) (Photos: Bugwood.org (L-R) – E.G. Vallery, USDA Forest Service, SRS-4552; Southern Forest Insect Work Conference Archive)

DISTRIBUTION

***Native*:** Central America (Belize, El Salvador, Guatemala, Honduras, Nicaragua), Mexico, southern United States

***Introduced*:**
Europe: Ireland (intercepted only)

Near East: Israel (intercepted only)

IDENTIFICATION

Adult southern pine beetles are short-legged, stout, about 3 mm long and dark reddish brown to black in colour (Thatcher and Barry, 1982; USDA Forest Service, 1989). The front of its head is notched and the hind end of the body is rounded. Newly emerged adults are soft-bodied and amber coloured but quickly harden and darken in colour (Thatcher and Barry, 1982). Larvae are crescent-shaped, whitish with an amber head and approximately the same length as adults when fully developed (USDA Forest Service, 1989). The pupae are also the same size and white. Eggs are smooth, pearly-white and found in notches along either side of the adult egg galleries.

HOSTS

Pinus spp. – primarily *P. taeda*, *P. echinata*, *P. elliottii*, *P. virginiana*, *P. rigida*, *P. palustris*, *P. serotina, P. pungens* and the introduced *P. strobus* in southeastern US; *P. ponderosa, P. engelmannii* and *P. leiophylla* in southwestern US; and *P. caribaea*, *P. engelmannii*, *P. leiophylla*, *P. maximinoi* and *P. oocarpa* in Central America.

BIOLOGY

Adult females lay eggs along S-shaped galleries constructed in the inner bark/sapwood interface (Billings *et al.*, 2004). Larvae feed in the inner bark and pupate in chambers near the bark surface. After completing their development, the new adults tunnel their way through the bark, creating small, round exit holes, and fly to new host trees. The beetles introduce a blue-stain fungus which penetrates into the wood interfering with the uptake of water and nutrients and quickly reducing the marketability of the trees (Billings *et al.*, 2004). All life stages of the southern pine beetle overwinter beneath or within the bark (Thatcher and Barry, 1982).

Southern pine beetles damage host trees by creating galleries and introducing blue-stain fungi (Photos: R.F. Billings, Texas Forest Service, Bugwood.org)

Initial attacks are generally on weakened trees however *D. frontalis* is capable of killing otherwise healthy trees. Other characteristics that contribute to the destructive potential of this beetle include: a rapid life cycle with up to ten overlapping generations per year; the ability of females to establish multiple broods (Payne, 1980); the ability to infest and kill pines of all ages beyond five years as infestations expand, regardless of the physiological condition of the host trees (Lorio, 1980); and infestation cycles that reach peak levels every six to nine years in certain portions of its range.

Once an attack is initiated on the tree trunk, the beetles release aggregation pheromones to attract other individuals of both sexes (Billings *et al.*, 2004). Thousands of adult beetles may respond to these pheromones and resin odours, and their concentrated attack overcomes the tree's defence system of resin production. The presence of aggregation pheromones often leads to the attack of trees on the periphery of the infestation by emerging beetles, causing the infestation to rapidly expand and increase tree mortality (Payne, 1980).

SYMPTOMS AND DAMAGE

Discoloured tree foliage is often the first indication of beetle attack; needles become yellowish, change to red, and eventually become brown within 1-2 months (Thatcher and Barry, 1982). Pines are often killed in groups ranging from a few trees to those covering several hundred acres.

Another typical indication of beetle attack is the presence of pitch tubes, small yellowish-white masses of resin 6-13 mm in diameter, on the trunk of host trees which mark the points of beetle attack (Thatcher and Barry, 1982). However, drought-stressed trees may not produce pitch tubes in which case reddish boring dust in bark crevices or at the base of the infested tree may be the only indication of attack.

Pine trees damaged by the southern pine beetle (Photos: G. Allard)

Characteristic S-shaped egg galleries that cross one another in the inner bark and on the wood surface can be observed upon removal of the bark (Thatcher and Barry, 1982). Adults or larvae may be observed in the galleries or around them if an attack is recent and with time most of the brood can be seen by chipping or shaving the bark (Thatcher and Barry, 1982).

In the five years following Hurricane Mitch in 1998, over 100 000 ha of pine forest in Central America were infested mainly with *D. frontalis* in association with other species of *Dendroctonus* and *Ips* spp. The resulting extensive tree mortality severely increased the risk of wildfires and negatively affected wildlife and recreation causing widespread and significant economic impacts.

DISPERSAL AND INTRODUCTION PATHWAYS

Some bark beetles are strong fliers with the ability to migrate long distances. However, the most common pathway of introduction into new areas is through transport of untreated sawn wood and wooden packaging materials with bark on them. Dunnage is also a high risk category of material. If wood is debarked, there is no possibility of introducing bark beetles.

CONTROL MEASURES

The preferred approach for mitigating losses from southern pine beetle attacks is an integrated pest management (IPM) programme involving preventative, detection and control measures (Billings *et al.*, 2004). Preventative measures include thinning to reduce stand density, removing damaged and weakened trees, and harvesting before trees become overmature. Once an outbreak begins, attention shifts to prompt detection and suppression of individual infestations which can substantially reduce resource loss (Clarke and Billings, 2003). Direct control methods include salvage removal, cut-and-leave, chemical insecticides, and burning infested trees. Cut-and-leave is a technique used solely for *D. frontalis* that consists of felling all trees with fresh attacks or bark beetle broods plus a buffer strip of adjacent uninfested trees and leaving them on site (Billings *et al.*, 2004). This procedure reduces beetle survival within infested trees and prevents infestations from growing larger by disrupting pheromone production. Natural enemies, such as diseases, parasites, predators, woodpeckers and weather, may help maintain beetle populations at low levels and bring outbreaks under control.

Direct control methods used against the southern pine beetle include cut-and-leave, salvage removal and application of chemical insecticides (Photos: R.F. Billings, Texas Forest Service, Bugwood.org)

Dendroctonus frontalis is an A1 quarantine pest for EPPO and member countries are recommended to prohibit the import of *Pinus* commodities from countries where the pest occurs, and optionally also bark of *Pinus* (EPPO/CABI, 1997). If bark is imported, then it is recommended that it be heat-treated or fermented and pine wood from such countries should be debarked, kiln-dried or treated. Chemicals can be used to treat infested conifer logs on an individual basis, and fumigation of stacks with methyl bromide can provide excellent control where facilities exist and temperature conditions are correct for effective treatment (EPPO/CABI, 1997).

References

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