TREE NOTES

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

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The Eucalyptus Longhorned Borer In California

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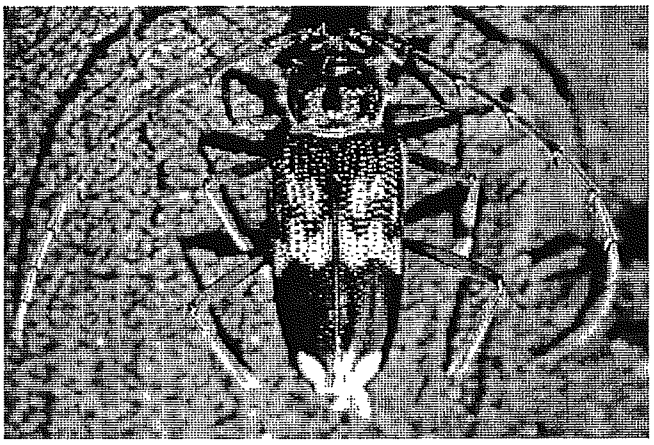
History

A native of Australia, the eucalyptus longhorned borer (ELHB), *Phoracantha semipunctata*, was first discovered in the United States in Orange County, California in 1984. Since then it has spread to other Southern California counties including San Diego, Riverside, Imperial, Los Angeles, Ventura, San Bernardino and Santa Barbara. In 1989, the beetle was found in Northern California in Alameda County, Contra Costa County, and Santa Clara County. The ELHB has become a pest problem in many countries throughout the world that grow eucalyptus for forest products. Wherever eucalyptus is planted outside of its natural range, the ELHB can inflict severe damage to eucalyptus trees.

Eucalyptus In Australia

There are as many as 750 species of eucalyptus in Australia. Each has evolved in response to specific, localized soil and climatic conditions. Most Australian soils originated from decomposed sandstone. In general, these soils are well drained, acidic and low in nitrogen and phosphorus. Surprisingly, eucalyptus grows best where rainfall is moderate. In dryer locations they are found along waterways and within flood plains.



Although ELHB is not a significant pest problem in native stands of eucalyptus, it does cause significant damage in urban areas.

Eucalyptus In California

Both soil and climatic conditions vary greatly in areas where eucalyptus is grown. California's climate is generally dryer and its soils contain a greater proportion of clay than Australian soils. Most eucalyptus are planted for windbreaks, wood lots, reforestation and erosion control. The blue gum and red gum eucalyptus predominate in these types of plantings. Trees in these stands are largely unmaintained, unwatered and planted very close together.

In the urban landscape, eucalyptus is becoming quite common. It is fast growing and hardy. Many new forms of eucalyptus, smaller and more tolerant of urban environments, are becoming available. In addition, many older stands planted at the turn of the century are now surrounded by urban development.

In Southern California, where this insect is well established, ELHB has caused considerable damage in unmanaged stands as well as in urban areas. The potential for continued spread of ELHB and subsequent destruction of eucalyptus is great. Factors which contribute to this include:

- **The transport of infested firewood**
- **The beetles' ability to fly long distances**
- **The absence of natural enemies in the state**
- **Eucalyptus are generally planted in harsh environments**

Biology Of The Beetle

Adult ELHBs are about 1-1.5 inches long. They are dark brown to reddish brown with a prominent light yellow zigzag pattern across the middle of their backs. Both sexes have long antennae, although the male's are somewhat longer.

The ELHB overwinters in the larval or pupal stage and the adults emerge when temperatures warm. Adults live from 40-180 days depending on the time of year. Females lay up to 300 eggs during their lifespan. Larval development from egg to adult ranges from 70-180 days. In California there may be up to two generations per year.

Female beetles lay their eggs under loose bark or in bark crevices. When the larvae hatch, they feed along the bark surface for a short distance before turning into the bark. The larvae burrow through the bark to the cambium tissue which lies between the bark and the wood. They feed in this region until they are ready to pupate. Just prior to pupation the larvae tunnel to the bark surface and then bore several inches into the wood to form pupal chambers. After the adults emerge from the pupal stage, they exit through the pre-constructed tunnels near the bark surface.

The ELHB is a member of the family Cerambycidae, commonly known as roundheaded borers. Beetles in this family usually attack recently dead wood. The ELHB is unusual because it attacks stressed, living trees. Larval feeding activity engraves the surface of

the wood and inner bark, creating a characteristic gallery pattern. This pattern can be used to identify the ELHB. Most galleries run parallel to the grain of the wood and radiate from the egg hatching site. They increase in size to over an inch wide and are packed with boring dust and fecal pellets. This burrowing activity cuts off the water conducting system of the tree, causing portions of the trunk or the entire tree to die.

Symptoms Of Attack

Sudden tree death is often the first observed symptom of beetle attack. However, repeated attacks over several seasons may precede this. Some of the earliest signs of beetle attack may include:

- **The flow of gum (kino) down the bark surface**
- **Areas of splitting or dead bark**
- **Elliptical, calloused-over wounds, 6 or more inches long**
- **Flagging branches (branches with dead leaves)**
- **Dead wood (which can also be caused by frost)**

There are several other beetles that attack eucalyptus. These include two native cerambycids, the oak cordwood borer, *Xylotrechus nauticus*, and *Necydalis cavipennis*, and two bostrichids, *Polycon stouti* and the leadcable borer, *Scobicia declivis*. All of these beetles bore in recently dead or dry wood and may be found in association with the ELHB particularly after trees have been killed.

Just as galleries made parallel to the wood grain are characteristic of the ELHB, the shape of adult emergence holes are also diagnostic. Native borers produce round holes while those of the ELHB are oval.

Control Measures

There are three basic avenues for control. They include chemical, biological, and stand or single tree management.

Chemical application has shown the least potential for control because:

- **The beetles' behavior minimizes their exposure to chemicals**
- **The active season of the pest ranges from April to November which requires long lasting insecticides**
- **Female beetles are not killed before eggs are laid**
- **Larvae may not be prevented from entering the bark**
- **Larvae are not affected by spray once they enter the bark**
- **Continued application of insecticides to large eucalyptus is very costly**

Biological control appears to be the most promising technique. This involves finding native Australian parasites or predators which can be successfully introduced into California. Unfortunately, this is time consuming and difficult. It requires extensive field research, laboratory evaluation and field trials before large releases can take place. Several Australian parasites, predators and fungi look promising.

Currently, the best way to reduce the impact of the ELHB is by keeping eucalyptus trees healthy and vigorous. Eucalyptus trees have a natural defense against the beetle. When the larvae of the ELHB bore into the bark, the tree responds by exuding gum (kino) at the wound site. Healthy trees produce sufficient quantities of kino to drown or flood out the larvae. Trees under drought stress may not be able to produce enough kino to defend themselves, particularly when multiple beetle attacks occur. If kino production slows, the larvae may survive but their feeding is restricted to a small area. As more beetles attack, kino production may cease, allowing the larvae to extend their tunnels.

It is likely that the ELHB locates stressed eucalyptus trees using behavior similar to other boring beetles. Females are attracted to weakened hosts by odor or other stimuli. Therefore, reducing stress in trees can reduce the frequency of beetle attack.

The management of eucalyptus trees depends on their intended purpose. In ornamental plantings, individual trees should be well spaced. If possible, space trees far enough apart so that their crowns touch only slightly at maturity. Deeply water within the tree's dripline about every 4-6 weeks during dry periods. Some sites may require more frequent watering. The soil should be moist to a depth of 12-18 inches following irrigation. Allow the soil to dry thoroughly after watering so root pathogens will not be encouraged. Fertilization may be of benefit; however, avoid fertilizing in the late summer and avoid fertilizers with phosphorus. Recent evidence suggests that eucalyptus are intolerant of high concentrations of phosphorus which can occur from repeated use of complete fertilizers.

Larger stands of eucalyptus may require various treatments depending on their purpose. Some of the approaches mentioned above may be applicable. In situations where trees are managed for wood products or screening, frequent cutting of small blocks of trees about every 5-10 years is one approach. The resulting sprouts can be managed for new trees until the next cutting cycle. If large trees are desirable, increased spacing and infrequent, deep watering will increase stand vigor. Thinning and pruning should be restricted, when possible, to the beetles inactive season (December through March).

Proper disposal of wood from thinning and pruning is important. The ELHB larvae can survive in branches as small as 1/2 inch in diameter. If wood cannot be buried or burned, or if it will be used for firewood, cover and seal it with 6 ml clear plastic sheeting. This will prevent beetles from colonizing or emerging from the wood while it dries.

Conclusion

In Southern California, where the ELHB was first introduced, it has become a major pest of eucalyptus and is now well established. Although the susceptibility of eucalyptus varies with species and vigor, many trees have been killed, causing much public concern. The ELHB is new to Northern California and its rate of spread and degree of impact is uncertain. It is likely that the impact will be similar to that occurring in Southern California. By improving the vigor of eucalyptus trees now, future damage may be avoided.

Further Reading

Scriven, Glenn T., Eldon L. Reeves and Robert F. Luck 1986. *Beetles from Australia Threatens Eucalyptus*. Calif. Agriculture, July-August :4-6.

Eucalyptus Longhorn Borer - Stop The Spread. University of California Cooperative Extension, California Department of Forestry and Fire Protection and California Department of Food and Agriculture.