TREE NOTES

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

Edmund G. Brown Jr.
Governor
State of California

Ken Pimlott
Director

John Laird
Secretary for Resources
Natural Resources Agency

NUMBER: 5 **March 2015**

Ponderosa Pine Twig Scale

Donald R. Owen
Forest Entomologist, 6105 Airport Rd., Redding, CA 96022

Ponderosa pine twig scale, *Matsucoccus bisetosus,* is a little-known forest pest that is difficult to diagnose because of its small size and cryptic feeding location. Immature stages of the scale have piercing mouthparts and feed on twigs, branches, and the trunk of ponderosa, Jeffrey and other hard pines. They are found beneath bark flakes and in cracks and crevices of the outer bark, often tightly embedded in bark tissue. The relationship between scale infestation and damage is poorly understood. Vigorous trees may show little evidence of infestation except for roughened, resinous bark on smaller branches and twigs. Stress appears to contribute to damage since trees on drier sites or trees planted off-site may also experience twig and branch mortality (flagging). Excessive flagging can weaken trees and presumably increase susceptibility to other pests, such as bark beetles. It is also possible that chronic infestations contribute to a general decline in tree vigor, as indicated by shortened and chlorotic needles, and poor needle retention.

Distribution and Hosts

This scale has been collected from ponderosa pine (*Pinus ponderosa*) across much of the western U.S. In California, it has been collected from ponderosa and Jeffrey (*P. jeffreyi*) pines and probably occurs throughout the ranges of these species within the state. It also has been collected from foothill (*P. sabiniana*), lodgepole (*P. contorta*) and Monterey (*P. radiata*) pines. Trees of all sizes may be infested.

Life History

Ponderosa pine twig scale has a one-year life cycle.

Figure 1. Adult female

Males and female adults are tiny, fragile, short-lived insects that are vastly different in appearance. Mating occurs on the bark of host trees from late February to early April, depending on elevation and weather. Female adults may survive many days waiting to mate. Males have not been observed to survive beyond a day.

Adult females (Fig. 1) are brown, approximately 4 mm long, with a simple bag-like body, short legs, antennae and eye spots. They emerge from the cyst (preadult) stage and move a short distance to a more open location on the bark to be mated. Here they wait motionless, with abdomen slightly elevated. After mating, they settle into a more concealed location to lay eggs and die. Females produce waxy filaments that envelope the eggs in a cotton-like mass, while their body shrivels. The egg mass (Fig. 2) is one of the most visible stages of the insect.

Figure 2. Egg mass

To reach maturity, males undergo an additional developmental step. An im-

Figure 3. Adult male approaching a female

mature, motile male emerges from the cyst stage just long enough to resettle, form a cocoon-like structure and pupate. It is from this pupal stage that the adult male emerges. Adult males are smaller than females with an elongate, mostly dark brown body, long antennae and legs, and compound eyes. They also possess one pair of wings held at an upright angle and a distinctive cluster of straight wax filaments that angle upward from the abdomen (Fig. 3). Adult males move quickly and erratically across the surface of the bark in search of a mate. They rarely fly.

Egg masses average close to 200 eggs. Eggs are oblong with broadly rounded ends, initially lemon-yellow but becoming orange-yellow as they mature. Incubation takes about 3-4 weeks. Orange-yellow larvae with legs, antennae, and eye spots (crawlers - Fig. 4) hatch from eggs in April or May. Crawlers move to protected locations on the bark where they insert their mouthparts and feed. These first-stage larvae feed and grow in place until sometime in July or August, when they molt to the legless, rather featureless cyst stage. Feeding and growth continues in this stage until a maximum size is reached in February. The shape of the cyst is influenced by bark pressure and ranges from pear– to disc-shaped. Cysts are dark brown, somewhat glossy, and have a sparse circle of wax filaments (Fig. 5). Female cysts reach a size of about 2 mm in diameter and generally are larger than male cysts.

Figure 4. Crawlers

Figure 5. Cyst

Figure 6. Branch flagging

Damage, Recognition and Diagnosis

Symptoms of infestation include abnormally rough and resinous bark on tree branches and twigs, branch and twig flagging (Fig. 6), poor needle growth and retention, and needle chlorosis. Birds forage for the scale and may remove extensive areas of loose, outer bark from the upper tree bole. Because these symptoms overlap those of other pests, further investigation is required to confirm pine twig scale as the probable cause.

The disease Diplodia blight and insect gouty pitch midge cause branch flagging, as do other pests on occasion. Most pests that cause flagging will be easier to recognize or diagnose than the pine twig scale. Eliminating other possible causes of branch flagging should be a first step in determining if the scale might be involved.

Figure 7. Cyst embedded in bark

Bark symptoms are a good indication of the level of scale infestation. Lightly infested bark will show little evidence of the scale's presence, while heavily infested bark cracks irregularly and has accumulations of resin in and around the cracks. If twig scale is the cause, it will be relatively easy to find either the cysts or their remains embedded in the bark (Figs. 7 & 8). A stout knife is useful for prying up bark flakes to expose the cysts. In April or May, it may also be possible to find egg masses. Egg masses and fully grown cysts can be seen with the naked eye, but are best viewed using a hand lens or dissecting microscope. Magnification is essential for finding the shriveled remains of cysts. Seeing the adults is unlikely because of their short existence.

While scale infestation can lead to widespread branch flagging, such episodes are rare and typically short-lived. In these instances, flagging has been reported in late spring or early summer, and it is common for entire branches to die, suggesting a hypersensitive reaction to infestation. Scales cannot survive if the infested branch dies, so extensive branch mortality is detrimental to the scale and is not typical. A widespread episode of branch flagging in Plumas County, California, lasted two years. Trees with branch flagging have high scale densities, but it is likely that a combination of factors contribute to this damage.

Little is known about endemic infestations of the scale. Poor needle growth and retention, and needle chlorosis are common symptoms of tree stress. Trees infested by the ponderosa pine twig scale often have these symptoms. To what extent the scale might contribute to these symptoms versus other factors like drought stress and infestations of other scales has not been investigated.

Matsucoccus californicus is a closely related scale that has also been collected from the bark of ponderosa and Jeffrey pines. Distinguishing between it and *M. bisetosus* is not possible in the field. Because identification of *Matsucoccus* species is based on morphology of adult females, a positive identification to species is not going to be possible in most instances.

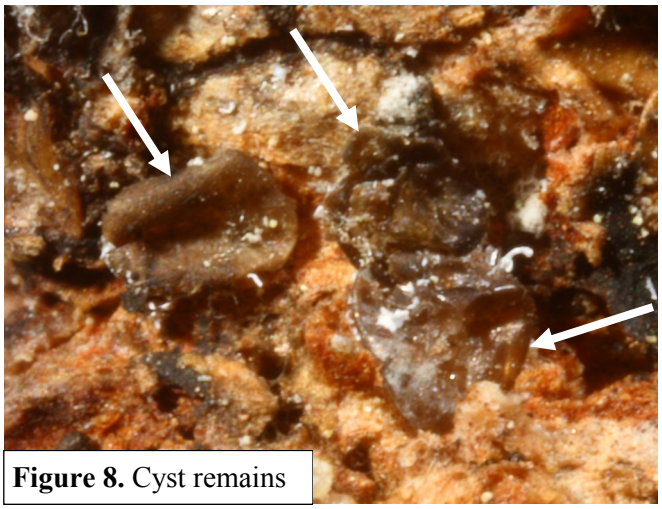

Figure 8. Cyst remains

Management

Damage from the ponderosa pine twig scale is rare enough that no studies have been conducted on its control. Observations indicate that healthy pines may become infested, but are unlikely to experience appreciable damage. It has been suggested that fast growing trees may be poor hosts if their expanding bark traps, injures, or crushes scales before they have an opportunity to reproduce. To improve tree health and growth, control competing vegetation and thin dense stands of trees. When planting, use trees appropriate for the site.

Many scale insects are kept under control by natural enemies - parasites and predators. In the case of bark-infesting *Matsucoccus* species, only predation, by birds or other insects, has been documented. No parasites are known. Use of pesticides on or near trees can disrupt the effectiveness of natural enemies and contribute to scale outbreaks. Although this particular effect has not been documented for the pine twig scale, careful use of pesticides is essential to avoiding unintended impacts on natural enemies that help keep scale populations in check.

When unacceptable damage occurs, have an expert confirm that ponderosa pine twig scale is the cause. If the scale is implicated, consider that the outbreak will likely be short-lived and control of the scale difficult due to its well-protected feeding location. A watch-and-see approach may be appropriate.

With other scales, contact insecticides and horticultural oils have successfully been used against the crawler stage. This requires monitoring to know when the crawlers hatch and precise timing of insecticide application. Specialized equipment is needed to treat large trees. Alternatively, systemic insecticides, applied to the soil or by bole injection, have also been used to control scales. When pesticides have the potential to come in contact with foliage, it is a good idea to conduct a test for phytotoxicity by applying the pesticide to a limited portion of the tree's foliage 7-10 days prior to full treatment.

Infested ponderosa pine branch

References

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Thanks to US Forest Service Entomologists Rob Flowers and Danny Cluck for reviewing this Tree Note