

EUCALYPTUS TORTOISE BEETLES

Integrated Pest Management for Home Gardeners and Landscape Professionals

Two species of eucalyptus leaf beetles from Australia, also called tortoise beetles (family Chrysomelidae), have been introduced into California. *Trachymela sloanei* was found in 1998 in Riverside County and now occurs throughout most areas of California where eucalyptus trees grow. *Chrysophtharta m-fuscum* was discovered in Orange County in 2003 and has spread to at least four nearby counties.

Notched eucalyptus leaves are usually the only obvious indication that trees are infested by tortoise beetles. Well-established and properly maintained eucalyptus appear to tolerate extensive leaf feeding. Thus, no tortoise beetle control is needed in many landscape situations, despite the tattered appearance of leaves. Providing trees with a good growing environment and appropriate cultural care are usually the most important actions for keeping eucalyptus healthy.

DAMAGE

Adult beetles and larvae chew semicircular holes or irregular notches along edges of eucalyptus leaves (Fig. 1). The beetles can remove most of a leaf's surface, leaving only the midvein, and they occasionally feed on new terminal growth. Unsightly, tattered leaves are usually just an annoyance that does not appear to threaten eucalyptus survival or health.

During heavy infestations, trees can lose most of their leaves, which increases tree stress. Although these beetles alone are not known to kill trees, their feeding adds to that of more than a dozen other new eucalyptus pests introduced into California during the last three decades. Com-

bined stress from multiple pests, especially if growing conditions or tree care practices are not optimal, could eventually lead to tree death.

Chrysophtharta m-fuscum is a serious pest of commercially grown baby blue eucalyptus (*Eucalyptus pulverulenta*). Baby blue, also called silverleaved mountain gum, is used as fresh cut foliage in flower arrangements, or it is dried, dyed, and sold in preserved arrangements.

The eucalyptus species preferences of these tortoise beetles have not been well documented. However, certain tree species are apparently preferred or avoided by these beetles and other major eucalyptus pests, as summarized and compared in Table 1.

IDENTIFICATION AND LIFE CYCLE

The two species of tortoise beetles have similar biology and appearance. By comparison, *Trachymela sloanei* adults are dark brown with blackish mottling, whereas *Chrysophtharta m-fuscum* adults are lighter colored and gray to reddish brown. Adults of both species are hemispherical (like half a sphere) or rounded, about $\frac{1}{4}$ to $\frac{3}{8}$ inch long, and superficially resemble a large lady beetle.

Female *Trachymela sloanei* lay 5 to 40 or more eggs side by side on leaves or under loose bark. The eggs are pinkish or light brown at first and become orange or dark brown to purplish as they age. Female *Chrysophtharta m-fuscum* lay 1 to 40 or more eggs side by side or in an irregular group on leaves. Eggs are bright orange when laid and become dark brown before hatching.

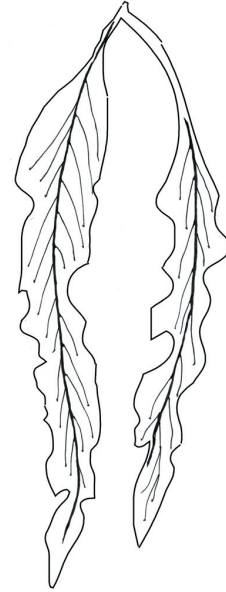


Figure 1. Eucalyptus tortoise beetle adults and larvae chew irregular notches along leaf edges.

The larvae of both tortoise beetle species superficially resemble caterpillars (larvae of butterflies and moths) or larvae of sawflies but can be distinguished by their appendages. Caterpillars, larvae of leaf beetles (tortoise beetles) and sawflies all have three pairs of true jointed legs on their thorax. Caterpillars and sawfly larvae also have several pairs of prolegs (fleshy, round, leg-like protuberances) on their abdomen. By contrast, tortoise beetle

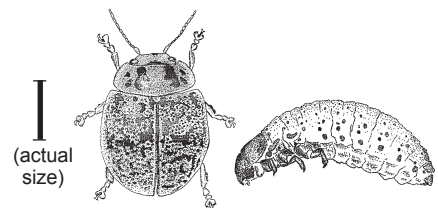


Figure 2. *Trachymela sloanei* adult (left) and larva (right).

PEST NOTES

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Table 1. Approximate Susceptibility of *Eucalyptus* (Gum) Species to Several Introduced Pests in California.

Common name (gum)	<i>Eucalyptus</i> species	Longhorned borers ¹	Redgum lerp psyllid ²	Tortoise beetles ³
Australian beech, silver dollar	<i>polyanthemos</i>	—	L	L
baby blue, silverleaved mountain	<i>pulverulenta</i>	—	L ⁴	M ⁵
blue ⁶	<i>globulus</i>	M	I–L ⁴	M ⁵
desert	<i>rudis</i>	—	M	I
dollar leaf, silver dollar	<i>cinerea</i>	—	L	—
flooded	<i>grandis</i>	I	I	M
forest red	<i>tereticornis</i>	—	M	—
gray ironbark	<i>paniculata</i>	—	L	—
hybrid	<i>trabutii</i>	L	—	—
Karri	<i>diversicolor</i>	M	I	—
lemon	<i>citriodora</i>	L	I ⁷	L
long flowered	<i>macandra</i>	—	I	—
manna	<i>viminalis</i>	M	I	M ⁵
mountain	<i>dalrympleana</i>	L	—	—
narrow leaved	<i>spathulata</i>	—	L	—
Nichol's willow leaved	<i>nicholii</i>	—	I	—
red flowering	<i>ficifolia</i>	—	L	L
red ironbark	<i>sideroxylon</i>	L	I–L	L
river red	<i>camaldulensis</i>	L	M	M
round leaved/red flowered	<i>platypus/nutans</i>	M	I–L	—
shining	<i>nitens</i>	M	M–I	—
silver	<i>crenulata</i>	—	—	L
spotted	<i>maculata</i>	—	— ⁷	L
sugar	<i>cladocalyx</i>	L	I–L	—
swamp mahogany	<i>robusta</i>	L	L	—
Sydney blue	<i>saligna</i>	M	L	—
white ironbark	<i>leucoxylon</i>	—	I	—

— = information not available
 M = more or most susceptible
 I = intermediate susceptibility
 L = less or least susceptible or reportedly not attacked

¹ Longhorned borers = reported susceptibility to *Phoracantha semipunctata*, which is believed to be similar to the susceptibility to *Phoracantha recurva*.
² Redgum lerp psyllid = *Glycaspis brimblecombei*.
³ Tortoise Beetles = based mostly on observations of *Trachymela sloanei*, except where footnoted #5.
⁴ Susceptible to bluegum psyllid (*Ctenarytaina eucalypti*), but this psyllid is generally under good biological control.
⁵ More or most susceptible to the *Chrysophtharta m-fuscum* tortoise beetle.
⁶ Has become an invasive weed, others species may be better choices for planting.
⁷ Susceptible to lemongum psyllid (*Cryptoneossa triangula*) and spottedgum lerp psyllid (*Eucalyptolyta maideni*).
 Adapted partly from: Brennan et al. 2001, Hanks et al. 1995.

larvae do not have any prolegs on their abdomen (Fig. 2).

Trachymela sloanei larvae are dark green to reddish brown with a black head and prothoracic shield (black area on the top and sides of the first segment behind the head). *Chrysophtharta m-fuscum* larvae are lighter greenish gray with a black head. Larval color in both species resembles that of host foliage, camouflaging the larvae. Larvae develop through four immature stages before pupating beneath loose bark, or they drop from the canopy to pupate in the soil or litter around the base of host trees. During warm weather, development time from egg to adult may be as short as 5 weeks. There are several generations per year from late winter through fall.

Trachymela sloanei larvae and adults hide under loose bark during the day and feed primarily at night. Also, they may be concentrated high in the tree, so determining the cause of damage may be difficult. If no leaf-feeding adults or larvae are observed on foliage, search beneath loose bark where adults, egg masses, larvae, and possibly pupae can be observed and collected for identification by your local county department of agriculture or University of California Cooperative Extension office.

Adults and larvae of *Chrysophtharta m-fuscum* rest during the day on leaves, where they are easily overlooked because of their color and inactivity. The young larvae often occur in groups on leaves, but as they mature and feed more they disperse. Adults of both species are commonly snared in spider webbing under bark and in orb weaver spider webs.

Another Leaf Chewer—the Eucalyptus Snout Beetle. The tortoise beetles described above can readily be distinguished from the only other eucalyptus leaf-chewing beetle in California, the eucalyptus snout beetle or gumtree weevil (*Gonipteris scutellatus*). Eucalyptus snout beetle adults are reddish brown weevils. Their elongated head and mouthparts (their “snout”), are

apparent when they are viewed from the front or side. The legless snout beetle larvae are yellowish green with a slimy coating. Young snout beetle larvae feed by scraping leaf surfaces, leaving discolored trails of tissue and causing elongated holes in the center of leaves. This feeding pattern (surface scraping and holes) by young snout beetle larvae is distinctly different from the leaf-edge notching caused by tortoise and leaf beetles or by older snout beetle larvae, which chew the margins of leaves and consume large, irregular patches of leaf tissue.

Eucalyptus snout beetles are uncommon in California, because it is under good biological control from an egg parasite (*Anaphes nitens*) introduced by University of California scientists. Where this weevil is newly introduced, a temporary outbreak may occur. Avoid applying pesticides and tolerate snout beetle leaf damage until the population of natural enemies increases enough to provide biological control. From then on, the snout beetle should not be a problem.

MANAGEMENT

Eucalyptus trees are attacked by several other types of insects, including eucalyptus longhorned borers, several psyllids, and more innocuous species such as the lemongum gall wasp (*Epichrysocharis burwellii*). For more information on these pests, see the *Pest Notes* listed in References. Some eucalyptus insects are now under good biological control, including eucalyptus snout beetle, bluegum psyllid (*Ctenarytaina eucalypti*), and (increasingly at least in Southern California) the redgum lerp psyllid. Learn how management efforts may affect these introduced pests before taking any actions against these leaf-feeding beetles (See sidebar.). Provide trees with good cultural care and avoid actions that are harmful to the natural enemies of any of these eucalyptus pests.

Cultural Control

Minimize tree stress by providing eucalyptus trees with proper cultural care and protecting them from injury. Depending on the situation, consider

providing trees with supplemental water during periods of prolonged drought, such as during summer and fall in much of California. Some eucalyptus species are drought tolerant, but others require supplemental moisture. If irrigating, avoid the frequent, shallow watering that is often used for lawns. A general recommendation is to irrigate eucalyptus trees infrequently (possibly once a month during drought periods) but with sufficient amounts so the water penetrates deeply into the soil (1 foot or more below the surface). This can be achieved by applying water slowly through drip emitters that run continuously for several days. In areas without an established irrigation system, a water tank truck can be used to temporarily flood soil. However, avoid prolonged waterlogging, especially around the root crown, because eucalyptus trees are susceptible to pathogens that cause Armillaria root rot and Phytophthora root rot, which are favored by wet soils. The specific amount and frequency of water needed vary greatly depending on the site and tree species. In addition, if a tree has been irrigated regularly, avoid prolonged interruptions to watering, particularly during the summer when insect pests are most active.

Avoid fertilizing eucalyptus. Succulent new shoot growth stimulated by excess nitrogen can increase the population and damage of eucalyptus-feeding psyllids. Eucalyptus in landscapes rarely require nitrogen fertilization for good growth. A six-year study of river red gum found no significant effect on tree size or survival due to annual nitrogen application. If other plants within the drip line of the tree require fertilization, use slow-release nutrient formulations.

Pest-Resistant Eucalyptus. If planting eucalyptus, choose species that are well adapted to the location, including tolerance to the prevailing moisture conditions. Although certain eucalyptus trees are drought tolerant, other species are adapted to more moist conditions. It may not be apparent that eucalyptus trees are stressed due

to drought or other factors until trees become affected by additional damaging influences, such as abundant insects. Be aware that a few species such as blue gum (*Eucalyptus globulus*) have become invasive and other species may be better choices for planting. Consult Table 1 for a list of the approximate susceptibility of eucalyptus species to tortoise beetles, longhorned borers, and psyllids.

Biological Control

Eucalyptus tortoise beetles are not normally pests in their native home of Australia except in cultivated stands; presumably natural enemies there keep beetle populations low. During a period of several years, University of California scientists introduced an egg parasite (*Enoggera reticulata*), originally from Australia, into California in an effort to control *Trachymela sloanei*. This tiny wasp searches under eucalyptus bark and in cracks and fissures, laying its eggs in tortoise beetle eggs. The parasite larva feeds inside and kills the egg and, after pupating, emerges as an adult to seek and attack more beetle eggs.

However, the parasite has not been recovered during field surveys in California, indicating the species probably has not become established. To date, no biological control research has been conducted for the newer pest, *Chrysophtharta m-fuscum*. The parasite *Enoggera reticulata* did establish and control another eucalyptus tortoise beetle species in South Africa, and several other eucalyptus pests have been controlled in California using introduced parasites.

Chemical Control

There is no published research conducted in landscapes on pesticide effectiveness for controlling eucalyptus tortoise beetles. Based on studies of these pests in field nurseries and eucalyptus stands, long-term control can be achieved by a soil drench application of the systemic neonicotinoid insecticides imidacloprid (Merit or Bayer Advanced 12-month Tree & Shrub Insect Control) or clothianidin (Arena—for commercial applicators

only). Foliar sprays of broad-spectrum insecticides such as the carbamate carbaryl (Sevin) or pyrethroids, including cyfluthrin (Tempo) and permethrin (Astro, Dragnet), are not recommended for eucalyptus in landscapes because of concerns about drift, runoff into water, and toxicity to natural enemies. In comparison with these contact sprays, systemic neonicotinoid insecticides can be more effective and provide longer-lasting control, although they can take several weeks after application before they become effective.

Eucalyptus trees are often very large and difficult to treat in landscapes. Many eucalyptus trees are stressed from other problems, and tree stress can reduce pesticide effectiveness as well as increase a tree's sensitivity to damage by the pesticide (called phytotoxicity). If insect damage cannot be tolerated and pesticides must be applied, make sure trees are receiving good cultural care before making a pesticide application.

Systemic Insecticides. These insecticides are absorbed by plants (such as through roots) and move to the plant parts where pests feed. The systemic insecticide imidacloprid is available to both professional applicators (Imicide, Merit) and home gardeners (Bayer Advanced 12-month Tree & Shrub Insect Control). Soil applications and tree injections (if labeled for these methods of application) minimize environmental contamination. The home-use product is relatively easy to apply to soil; it is measured into a bucket, diluted with water, and poured onto soil near trunks, as directed on the label.

Limit any treatments to situations where damage is intolerable or pests threaten tree survival. Most pesticides are at least somewhat harmful to beneficial predators or parasites. Imidacloprid applied to flowering plants or the soil beneath them may move to nectar and poison the nectar-feeding adult parasites, which during their larval stage partially or completely control other pests. Be aware that imi-

IPM for Eucalyptus Tortoise Beetles

Combine several practices in an Integrated Pest Management program to prevent damage from tortoise beetles and other pest insects on eucalyptus:

- ✓ Choose well-adapted eucalyptus species.
- ✓ Deep-water drought-stressed trees with drip hoses. Avoid sprinkler irrigation.
- ✓ If pruning is necessary, prune in December or January to avoid borer attacks to freshly cut limbs.
- ✓ Don't fertilize trees. Fertilizing increases damage from psyllids, weakening trees.
- ✓ Use pesticides rarely and always as a last resort. Most tortoise beetle infestations do not require pesticide treatments, and pesticides disrupt biological control of other pests.



imidacloprid application may contribute to outbreaks of spider mites and other pests.

When using systemic insecticides, whenever possible consider making a soil application instead of spraying foliage or injecting or implanting trees. Injecting or implanting trunks or roots injures trees, and it is difficult to repeatedly place insecticide at the proper depth. Especially avoid methods that cause large wounds, such as implants placed in holes drilled in trunks. Do not implant or inject roots or trunks more than once a year.

Based on use against other pests, the most effective time to apply imidacloprid on or into soil beneath trees is late winter to early spring, just before or soon after new leaves emerge and before the end of California's rainy season. Make an application before

rainfall, or follow the application with irrigation. Efficacy is delayed until sometime after application.

Because pesticide recommendations, registrations, labels, and products change regularly, check current product labels or contact the University of California Cooperative Extension in your county for the most current recommendations on the use of insecticides.

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For more information contact the University of California Cooperative Extension in your county. See your telephone directory for addresses and phone numbers.

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Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Pesticides applied in your home and landscape can move and contaminate creeks, rivers, and oceans. Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash or pour pesticides down sink or toilet. Either use the pesticide according to the label or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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